UNITED STATES ARMY

AVIATION DIGEST

SEPTEMBER 1985

the Challenge of Winning

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BACK COVER: **ATC Action Line: Parachute Jumping**

COVER: **How shall Aviation successfully join and synchronize with Armor and Infantry. The how-to-fight issues for the combat Aviation brigade are explained in "The Challenge of Winning," page 2. Illustration by Paul Fretts.**

Honorable John O. Marsh Jr.
Secretary of the Army

Major General Ellis D. Parker
Commander, U.S. Army Aviation Center

Brigadier General Rudolph Ostovich III
Assistant Commandant
U.S. Army Aviation Center

Richard K. Tierney
Editor

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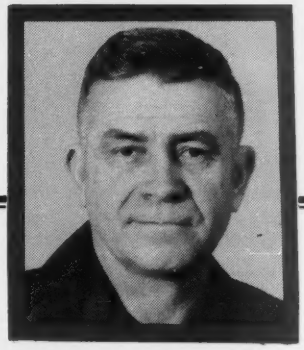
Major General Ellis D. Parker
Chief, Army Aviation Branch



Aircraft Survivability Equipment Trainer (ASET I)

AS WE ARE well aware, the threat we as Army aviators can expect to face on the next battlefield is becoming ever more sophisticated. To meet this challenge, the Army is developing and fielding a variety of passive and active countermeasures to address current and anticipated radar, infrared, laser and optically acquired weapon systems. With the materiel side of our house in order, the challenge is now to improve upon our aircraft survivability equipment (ASE) training with renewed emphasis on training devices, programs and curriculum.

The Aviation Center and the Program Manager for Aircraft Survivability Equipment have developed a strategy for individual, crew and collective ASE training for Army Aviation units. This strategy consists of four ASE training (ASET) devices. *The first of these, the ASET I,* is a software package for the AN/UYK-71 MICROFIX Computer. It is currently being fielded and is intended to be an interim program. It has two major objectives—to get needed ASE and threat training out to the field quickly, and to solicit your feedback to ensure that its follow-on, *the ASET II,* is the best possible product. I need the assistance of commanders and staffs at all levels to get our soldiers trained on ASET I. Without your full commitment to this end, our materiel investment will be wasted.

ASET I will be an individual desk-top trainer for threat, ASE and related subjects including secret material. The MICROFIX Computer is currently found only in Military Intelligence (MI) battalions. It is, therefore, available to Aviation units on a time-sharing basis. The Department of the Army has recently approved a plan to place MICROFIX systems at every synthetic flight training system facility worldwide to relieve the training load on MI systems. ASET I is oriented toward scout and attack aircraft, but all of the threat training and some of the ASE material are applicable to all aviators.

ASET II will be the follow-on desk-top trainer and will be fielded in fiscal year 1987. It will contain material for all the aircraft in the inventory. More importantly, it will be fielded down to where it is needed—the Aviation unit. Since it will incorporate the lessons learned from ASET I, your response will help to make it a quality product. *ASET III* will be an in-flight crew training device that will allow instructor pilots to program threat signals into the APR-39 and evaluate a crew's use of evasive maneuvers and ASE in order to avoid or defeat the threat and accomplish the mission. *ASET IV* will give Aviation units the ability to conduct collective training against a variety of threat emitters.

We expect that these new ASE training devices will be valuable aids. I am confident that commanders and aviators alike will find them to be very worthwhile and informative. Get out and use ASET I, then send your comments—both positive and negative—to us here at the Aviation Center by writing: Directorate of Training and Doctrine, ATTN: ATZQ-TD-ST-ASTM, U. S. Army Aviation Center, Ft. Rucker, AL 36362-5000. In return, we'll come back to you with an even better trainer to prepare you for the next battle with the confidence that comes from knowing your enemy *and* knowing you can defeat him.

photo by SP4 Kelley Longbine

Major General Ellis D. Parker
Commander
U.S. Army Aviation Center
Fort Rucker, AL

To put Aviation on an equal footing with the other combat maneuver arms, at AVNEC 83 we developed an integrated doctrinal foundation for Aviation as a whole. From AVNEC 83 grew AVLOG 84 which was tasked to outline the methodology to complement the results of AVNEC 83. Now that Aviation is a separate branch, blessed with the full rights as are the other combat maneuver arms, how can Aviation successfully integrate its personnel, doctrine, equipment and training goals with those of the other maneuver proponents to win on the modern air-land battlefield?

the Challenge of Winning

CLEARLY NO branch today can operate independently of its fellow members of the combined arms team. Each combat, combat support and combat service support element is essential to success on today's battlefield. The Aviation Branch, because of its unique proponent mission area as depicted in figure 1, has responsibilities that cross the full spectrum of combat, support and service support areas. The challenge to Aviation today is to successfully link and synchronize our personnel, doctrine, equipment and training goals with those of the Armor and Infantry maneuver proponents under the guidance of the Combined Arms Center (CAC), Ft. Leavenworth, KS, to win on the battlefield (figure 2).

FIGURE 1

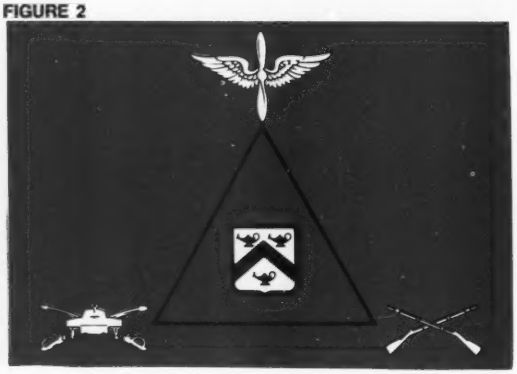
The Aviation Branch is dedicated to living up to the standards set by the other maneuver arms and proponent schools. That dedication is carefully reflected in the continuing pursuit of our mission area responsibilities, the education of our branch members and in the education of the other branches. Previous articles have covered the general employment of Aviation forces and our accomplishments in the training, personnel and equipment arenas.

This article further explores some other how-to-fight issues for the combat Aviation brigade (CAB) and the subsequent contributions of Aviation to the air-land battle.

One of our first tasks as a branch was to develop an integrated doctrinal foundation for Aviation as a whole. We called in all branch experts from the field and schools, representing every echelon of command from company through corps, to attend the Army Aviation Employment Conference (AVNEC) in November 1983 (see *Aviation Digest*, January 1984).

The intent of this conference was to examine how to best employ Aviation in the various levels of battlefield intensity. The insights and consensuses gained from AVNEC 83 helped to form the basis for the Army Aviation capstone manual, Field Manual (FM) 1-100. Once we had begun to solidify how-to-fight Army Aviation, the next goal was to develop a logistical scheme to support the tactical framework. Toward that end, the Aviation Center, Ft. Rucker, AL, in conjunction with the Aviation Logistics School, Ft. Eustis, VA, hosted another conference in the fall of 1984. The work at the Aviation Logistics Conference (AVLOG 84, see *Aviation Digest*, January 1985) began to outline the methodology to complement the results of AVNEC 83 and the Aviation tactics envisioned in the production of FM 1-100 and the combat Aviation brigade manual, Field Circular (FC) 1-111 (figure 3). The continuing development of that logistical scheme is proceeding at full speed under the capable supervision of Major General Fred E. Elam at the Aviation Logistics School.

FIGURE 2



FC 1-111 evolved from FM 1-100. It specifically addresses the employment of the CAB for the heavy and light divisions and for the corps. The production of this manual was a significant achievement, since the manual began with a joint working group from the Armor and Aviation Centers, the Aviation Logistics School, the Combined Arms Center and the Training and Doctrine Command (TRADOC), Ft. Monroe, VA. Its tasks were culminated 11 to 14 December 1984 during a final workshop held at the Aviation Center. Again, school and field repre-

sentatives, CAC, TRADOC and U.S. Army War College representatives worked diligently to ensure the publication of a combined arms oriented manual.

We recognized that the predominant operation for the CAB will be in conjunction with the ground maneuver forces, but that the unique mobility of Aviation enables our participation in multiple missions and in independent maneuver operations across the width and depth of the battlefield. These latter types of operations obviously require careful planning, solid command, control, communications and intelligence (C^3I) and an appropriate logistical base. Certainly all of those emerging doctrinal issues have not been totally solved in the short time we've been in business as a branch. Indeed, the Aviation Center is committed to improving the foundation manuals and to completing the initial versions of the remaining unit manuals (figure 4) by the fall of this year.

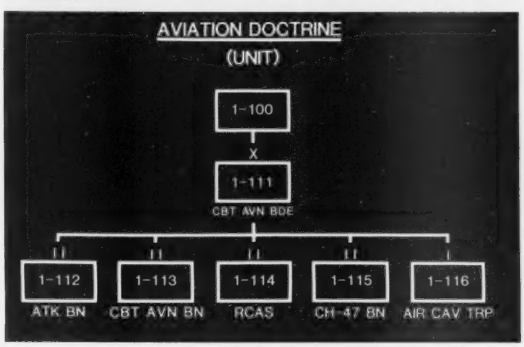
The CAB and its subordinate units as addressed in their respective doctrinal manuals, whether at the division or corps level, provide the commander a primary means to carry out the battle. For clarity and purpose of analysis, the combined arms team speaks of the deep, close-in and rear battles, but the division/corps commander must fight one battle and must do it all well. With that mission, the value of an organization that can maneuver unrestricted by terrain and increasingly so in all-weather and night conditions, that can mass significant antiarmor combat power, and can move forces and supplies across the battlefield in minutes must not be underestimated.

The Aviation brigade, relative to the previous H-series organizations (force structure organizations), significantly improves combat power, but it will still conduct the traditional missions associated with Aviation units in the past. The key difference to the division level is the addition of another maneuver brigade headquarters with the staff to plan and execute all combat operations. The Aviation brigade is a maneuver brigade as structured. The amount of time actually spent task organized with other combat and combat support forces has nothing to do with the utility of the brigade as a maneuver and combat arm since it fights and supports alongside the other members of the combined arms team.

One unique aspect relative to the other maneuver brigade headquarters is that the Aviation brigade commander must have a different perspective of the battlefield, since his areas of operations normally coincide with that of the division or corps (figure 5). The Aviation brigade commander will be required to operate with his forces spread laterally and indepth throughout the battlefield. The brigade staff, in conjunction with the division staff and supporting elements from the division support command, must be particularly cognizant of current and future operations to allow the coordination of maneuver and combat support and the corresponding movement of class

FIGURE 3

FIGURE 4



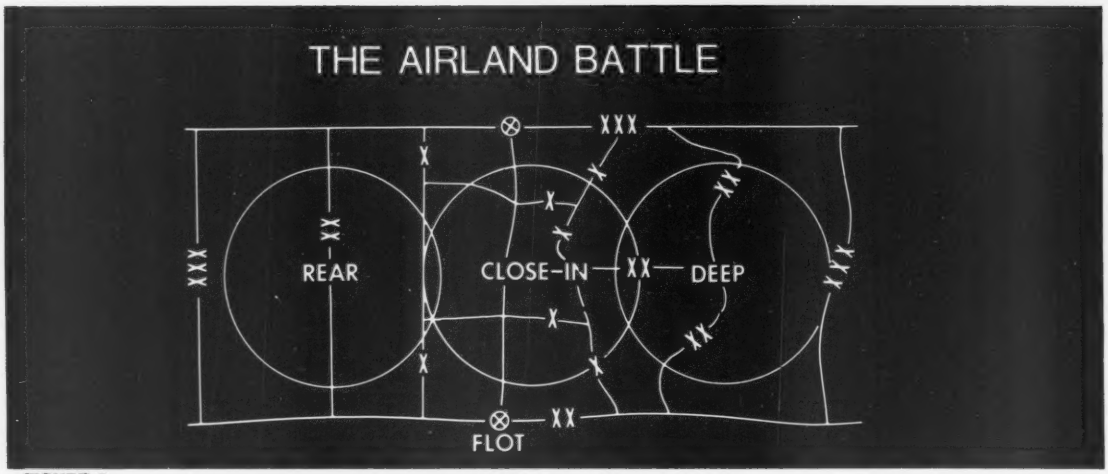


FIGURE 5

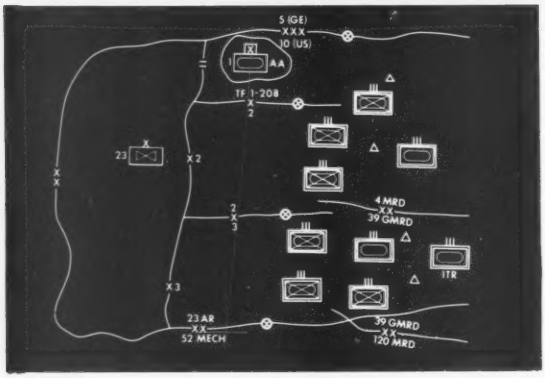


FIGURE 6

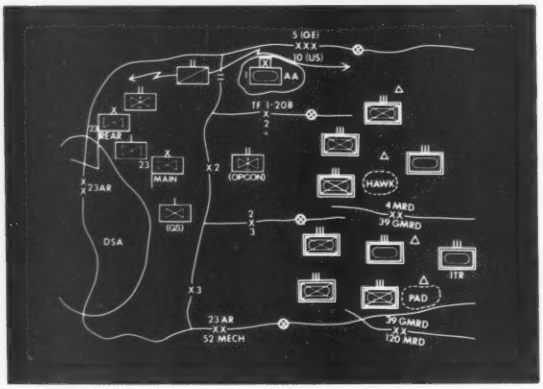


FIGURE 7

III (petroleum and solid fuels) and class V (ammunition) to support these operations.

The Aviation brigade is designed primarily to fight, command and resource Aviation forces, but it may be task organized with other combat and support units placed under its operational control or attached to it. In this situation, the brigade conducts operations just as any other brigade in the division. Other situations and missions as described in the earlier maneuver school (Armor and Infantry) articles may require units from the brigade to work directly for other headquarters or directly under division control.

To further represent the Aviation brigade fighting and supporting the division as a whole, an extract of the Combined Arms Center's common scenario serves to describe some of the doctrinal points for employing the brigade:

Enemy armor and mechanized forces have been detected by corps long-range Aviation surveillance assets and other intelligence means. Friendly forces have moved to preplanned positions. The X U.S. Corps and in particular the 23d Armored Division is depicted as shown in figure 6. The 23d Armored Division is opposed by the 4th Motorized Rifle Division (MRD) and the 39th MRD which form part of the first echelon of the Eighth Combined Arms Army (CAA). The 79th Tank Division (off the map to the east) is in the Eighth CAA's second echelon and is expected to be committed in the 23d Armored Division's sector. In addition, an independent tank regiment (ITR) is expected to move toward the 3d

Brigade's sector. The mission of the 23d Armored Division is to destroy the first echelon divisions and the ITR of the Eighth CAA.

Based on the missions of the 23d Armored Division and the scenario, in the first phases of the operation, the 23d CAB is positioned as depicted in figure 7 and supports the overall battle plan within the entire depth of the battlefield. The CAB (-) is held in reserve as a command, control, coordination and planning center with specific on-order missions for level III (battalion size or larger) rear battle, deep battle and for supporting the main battle area.

The CAB commander has provided the cavalry squadron to the division to initially screen the northern flank along a specified area. On-order, the cavalry squadron will revert to brigade control to provide surveillance of the rear area, and to fulfill C^3 functions in the event of extensive enemy use of electronic warfare. Long-range reconnaissance and surveillance teams have gone forward with the covering force and now monitor enemy movements as stay-behind intelligence gathering elements. The CAB commander has placed one attack battalion under the operational control of the 2d Brigade to assist in shaping the battlefield. The CAB has provided liaison teams to the division and the 1st and 2d Brigade tactical operations centers to assist in planning and in gathering and returning specific information to the CAB. The combat Aviation company will rapidly resupply critical items of selected classes of supply, laterally reposition stocks of class III and V, and air assault either dismounted infantry, engineers or air defense artillery teams for total battlefield mobility.

The combat Aviation company, general support will provide special electronic mission aircraft (SEMA), specifically the QUICKFIX helicopter, to the division's combat electronic warfare and intelligence battalion, Field Artillery aerial observer aircraft to the division artillery and command and control aircraft to the division command group, the CAB, and the other maneuver brigade headquarters or other elements as required. If the corps commander allocated medium lift assets or other Aviation elements to the division, the division commander would normally place them under CAB control.

Turning to the rear battle, as shown in figure 8, recall that the CAB was responsible for level III and that the cavalry squadron had an on-order mission to conduct reconnaissance and surveillance of the rear area. Based on a thorough intelligence preparation of the battlefield, the intelligence provided by the corps and division SEMA assets, and the results of the reconnaissance of the rear area for likely battalion (±) sized air assault/air drop

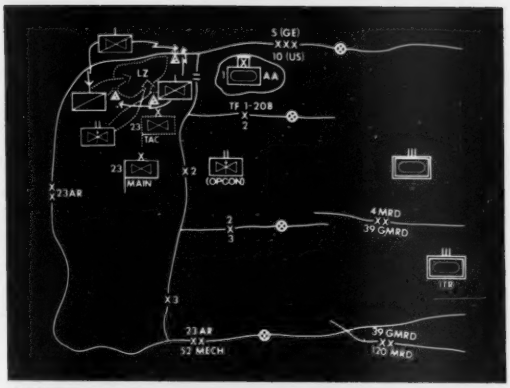


FIGURE 8

objectives, the CAB has focused its efforts on an area adjacent to the northern boundary. This area sits astride a major avenue of approach from the 5th German Corps area and it contains key lines of communications.

Although efforts would be made to intercept a threat air assault force, in this case the threat force already has been committed to the area. The cavalry squadron has established screens with the two air cavalry troops and observation points with one of the ground troops. The remaining ground troop serves as the initial reserve or strike force. The CAB controls this operation from a tactical command post and is in a position to further respond with the reserve attack helicopter battalion (AHB), or with a limited air assault to further deal with threat activity.

In the main battle area (figure 9, page 8), one AHB remains under the operational control of the 2d Brigade. It is integrated into the 2d Brigade's scheme of maneuver with the emphasis on antiarmor operations as discussed in Major General Brown's article on heavy brigade operations. The AHB provides the 2d Brigade commander a means to shape the battlefield, control the forward line of own troops, conduct deep battle and to exploit the situation. The AHB liaison officer, who reported to the 2d Brigade early on in the operation, serves to tie in schemes of maneuver, air defense and fire support requirements, coordinates for land space and movement of Aviation units, and provides a vital link back to the AHB commander. The Aviation brigade and the AHB staffs continue to coordinate on support concerns. Planning for the future employment of that AHB also will be conducted with the 1st Brigade for its contingency missions.

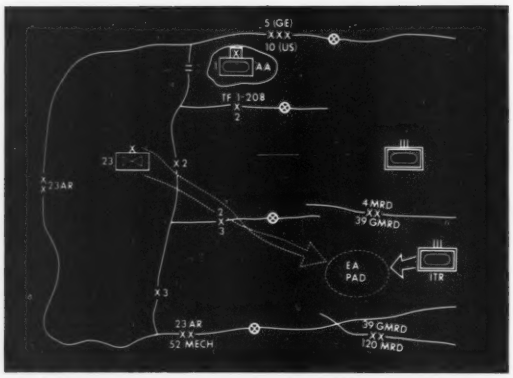


FIGURE 9

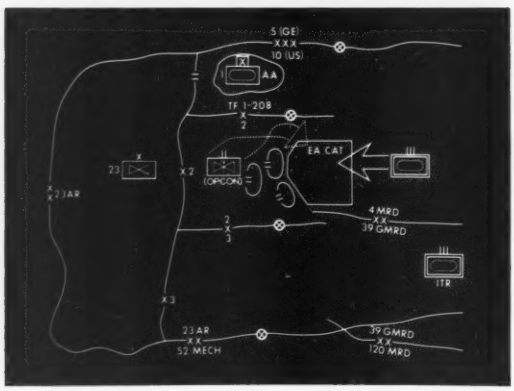


FIGURE 10

Illustration courtesy of King Radio Corporation

The deep battle (figure 10) has been discussed and studied extensively during the last year. The Aviation brigade provides the division with a means to change courses of action by upsetting the threat's timetable through attrition of specific command and logistical modes, delay or disruption of follow-on forces or by destruction of these forces. Other possible deep battle missions include provisions for air assault operations to retain key chokepoints or lines of communications.

The most recent example of a corps-level Aviation offensive deep battle operation was conducted in Return of Forces to Germany (REFORGER) 1984. At this point in the REFORGER scenario, Blue forces had completed a broad advance in anticipation of continuing into an exploitation. A major river obstacle to the front would pose a delay to the advance unless key bridgeheads could be secured intact. The mission given to the corps Aviation brigade was to conduct air assault operations to seize an objective, secure bridges and assist following attacking units in a passage of lines (figure 11).

The concept called for a night air assault into the objective area. Once secured, the brigade defended until a link-up and subsequent passage of lines could be completed. The task organization included an infantry battalion, air defense teams, engineers, air cavalry, attack, lift and medium lift assets.

The objective (figure 12) was seized by securing the key bridges and the main avenues of approach with the infantry forces. Engineers and mine laying aircraft prepared bridges for destruction and helped seal off the objective with minefields as depicted.

Initially the objective area was out of range of supporting artillery. As the other attacking forces progressed, the objective area was designated as a restricted fire area and the brigade fire support officer continued to coordinate for the requisite fire support. In addition, Air Force disruptive systems and close air support conducted preplanned and immediate support operations. Planning also included the establishment of specific airspace command and control procedures for the movement to and seizure of the objective area.

In this case, the employment of an Aviation brigade, task organized with other forces, complements air-land battle doctrine. The components of combat power are synchronized to support the corps commander's intent of exploitation and they are *carefully balanced* to project *the right force, on time and in a key area.*

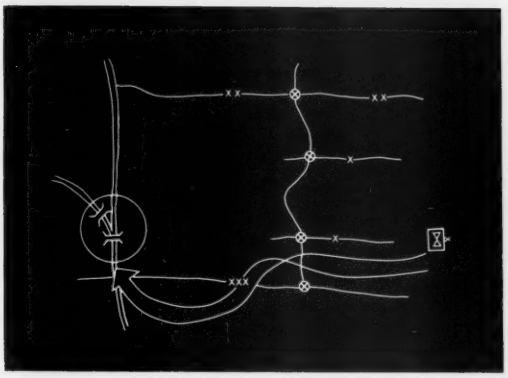


FIGURE 11

In order for Army Aviation to maintain full status as a combat maneuver arm, the type of emerging doctrinal issues discussed in this brief article must continue to be addressed by all of the members of the combined arms team. The Aviation Branch's combat systems, doctrine, equipment and personnel have resulted in major improvements to the combat effectiveness of the entire combined arms team. Clearly, Army Aviation has met and will continue to pursue the "Challenge of Winning."

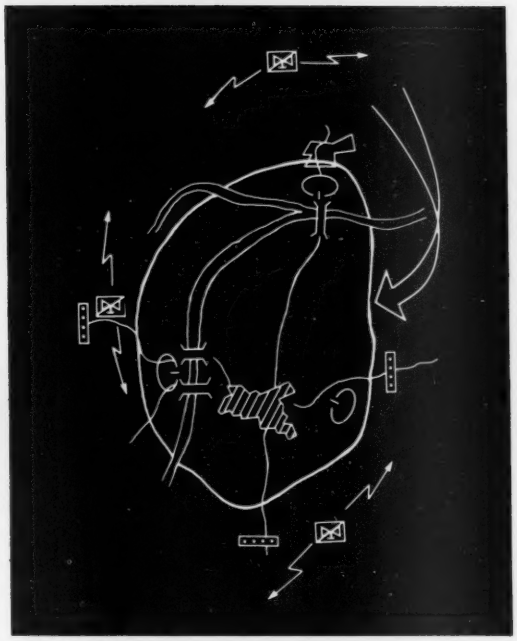


FIGURE 12

Previous *Aviation Digest* articles have ably covered some close combat heavy, close combat light and fire support views on employing selected assets of the combat Aviation brigade.

• "Field Artillery and Army Aviation," Major General John S. Crosby, chief, Field Artillery Branch, February 1985.

• "Attack Helicopter Operations on the Heavy Battlefield," Major General Frederic J. Brown, chief, Armor Branch, July 1985.

• "The Combat Aviation Brigade In the Light Infantry Division," Major General John William Foss, chief, Infantry Branch, August 1985.

(Copies of these articles can be obtained by writing to *Aviation Digest*, P.O. Box 699, Ft. Rucker, AL 36362-5000; or by calling AUTOVON: 558-6680; FTS: 533-6680; Commercial: 205-255-6680.)

MONTHLY WRITING AWARD

AIR ASSAULT

The Cross-FLOT Raid

CPT John F. Murphy

IT IS A COOL, gentle autumn evening, the sun has already set and there will be no moon tonight. All is silent and still, one can just about smell the anticipation in the air, like something is about to happen.

1925 Hours

1LT Rossiter was about to put out his cigarette, when the battery commander appeared out of the darkness. "Good evening, sir!"

"Good evening, Bill. I just checked all the guns and everyone appears to be ready. What about the fire direction center (FDC)?" inquired the commander.

"Check sir!" replied 1LT Rossiter, his FDC chief. "All the pre-plots have been doublechecked, they are rehearsing the timing sequence now." He examined his watch by the thin beam of light that leaked out of the FDC tent. He said, "We have to be ready to go in 33 minutes. Rounds will be in the breach and data on the guns. We are going to fire prep both forward line of own troops (FLOT) penetration points for 3 minutes, stopping 2 minutes prior to the lift's passage through the lines, and then alternate sections of three guns ready to shift off the air control points (ACPs) in order until they are out of range. Then it will be up to those Cobra (AH-1) drivers to protect them until the lift is back in range on the way home."

The battery commander glanced first at his watch and then off into the night. "First rounds go downrange in 32 minutes," he said. "Man, it is dark as hell out there. Goggles or not, I wouldn't want to be flying on this mission."

"Check sir!" Rossiter responded.

1931 Hours

CPT Robertson's troops were ready, he knew that, as sure as he knew they would give him their all. The company had linked up with the pathfinders 5 minutes before, local security was set and last minute checks were being completed. There had not been enough time for a full blown rehearsal for the entire company, but everyone from squad leaders on up had talked through the entire operation twice on a roughly scratched out sand table. The captain's thoughts were interrupted by SSG Nelson of the pathfinders. "Sir, would you like to look over the pickup zone (PZ)?" he said. "Everything is ready to receive the aircraft. We have just over 25 minutes."

"OK sergeant, let's see if it rates my seal of approval."

"Have I ever disappointed you before sir?"

"Never sergeant, let's go."

1935 Hours

CPT Sims looked down in his assembly area at the two UH-60 Black Hawks still on the ground, running. They were back-ups in case any of the six in his flight had trouble making the PZ time. As he looked up at the two Black Hawks out in front of him, he thought to himself that this was just the beginning of a long night. Preparations had begun hours ago, even before the air mission briefing at the Infantry battalion tactical operations center (TOC). Now it was all a matter of teamwork.

1939 Hours

CW2 Griffith sipped at his coffee while his copilot read a novel by flashlight. The medic was double-checking everything in the back. Everything had to be ready for immediate launch if medevac was needed in support of tonight's mission. Now all Griffith could do was wait and hope he had enough coffee to last.

1942 Hours

CPT Allen adjusted the counterbalance weight on the back of his SPH-4 helmet after climbing into the backseat of the AH-1S. He looked over to his right and could see that the crew on the next armament pad also were almost ready. Over the top of their canopy he could see his second section of two Cobras circling to land at his six o'clock. They were just arriving to load up for their portion of the mission. They were to cross the FLOT just minutes behind the lift and support the commander's ground tactical plan, while the first section escorted the lift aircraft back across the FLOT. Allen noticed the ever thickening overcast and commented to his front seat, "As if it wasn't dark enough to start with, now someone had to go and wet on my candle. You ready to go? We've got 13 minutes until link-up."

1956 Hours

1LT Rossiter repositioned himself on his stool and alerted his people, "First rounds downrange in 2 minutes."

An echoing chorus of *"check sir!"* was their collective reply. SSG Nelson looked up from his watch and could hear the inbound aircraft and reached down for his infrared strobe light. CPT Sims looked past the two UH-60s to his front. "I've got the strobe at about 1230 or one o'clock," he said to his right seat as he pointed across the dash. "Lead has it, he's starting to turn."

CPT Allen instructed his copilot to look back and get a visual on his wingman as he concentrated on looking for the lift. "I've got four, no, all six now, they're in a decel," he said on the intercom. "Looks like they're going in. We'll extend out to the left and land at their six o'clock."

CPT Robertson reminded his radio telephone operator, "Remember to hook that PRC-77 into that roof antenna ASAP." As he looked up, the lead UH-60 was over the tree line coming into the PZ. He thought to himself, "SHOWTIME!"

1LT Rossiter pointed at the corporal holding the field phone, who yelled, "FIRE!"

Rounds impacting at preplotted passage points as a lift departs a PZ, 5 minutes away. Gunship escort for immediate suppression of enemy air defense assets. A shifting of fires as the lift approaches the FLOT and the air assault company team is off on a cross-FLOT raid. Their target: any number of possibilities; an enemy TOC, a key terrain feature or bridge, possibly even a forward arming and refueling point. This is not a simple maneuver but rather a well balanced, well coordinated execution of detailed planning. It is combined arms team brought together to strike out at an enemy, day or night, well inside the enemy's lines to cripple his ability and his will to sustain the fighting by presenting him with a set of variables that he is hard pressed to cope with: *when, where, how* and *from what direction* will his foe strike next?

The air assault company team on a cross-FLOT raid capitalizes on five of the nine U.S. Principles of War: offensive, surprise, maneuver, mass and economy of force to take the battle to the enemy. This is not easily done. It cannot be conceived and planned as an air movement table supporting the ground tactical plan.

There is only one mission, but it is conducted in three phases.

First is the insertion, which is an offensive operation all its own, characterized by all the elements of any

attack, i.e., it must contain the element of surprise, be violent and sustain momentum.

Second is the mission on the ground, whatever that may be. It is the prime objective around which all else revolves.

Finally, the extraction, which is another attack, conducted to retrieve the troops after completion of the ground mission.

Each phase is as important as the others toward a successful outcome. Obviously Infantry believes the ground phase to be the most important and Aviation believes the insertion to be the most critical phase; but all phases are interrelated so tightly that none outweighs the others. If the Infantry commander does not arrive at the landing zone with enough troops to conduct the ground phase, the chances of success are diminished greatly. On the other hand, if the assault troops cannot sustain the momentum of the attack, the final outcome will not be as great as initially planned.

It is the mission of the aviators to provide a service to ground commanders to conduct their missions. But it is not support. They are going to conduct this attack with them. Aviators are primarily responsible for the first phase of the attack—the insertion; but the ground commanders must allocate enough time and resources for detailed planning of the first phase of *their* attack. Good intelligence briefs for the air mission commander are of paramount importance in route selection. There is no greater intelligence gathering asset in the Army than the aviators themselves. In their company assembly areas, Aviation platoon leaders have access to the most timely information about the enemy, terrain and weather. But they must have the time to tap these resources.

The dedication of artillery assets to support lift aircraft on the move both to and from the objective is another resource for which time must be allocated to allow detailed planning. Just because there are no longer troops onboard does not make an aircraft any less of a target, nor does it relinquish ground commanders of their responsibilities to assist in the safe passage of our aircraft back across the FLOT. They may be the only way home, or means of resupply. Preparation time is needed for briefings and reloading of attack helicopters for an escort mission, especially if they were previously being used in the antiarmor role. That is where ground commanders' knowledge, or lack thereof, of aircraft capabilities or limitations can be enhanced or overcome with the assistance of the Combat Aviation Party (CAP)* down to the Aviation liaison officer level. Then there are the elements of the contingency plans or planning for the unexpected that we know to expect; for example, the dedication of medium lift assets, security assets and medevac for the immediate recovery of aircraft and crews downed in enemy territory, before they are subject to capture by the enemy.

The Air Assault Company Team is an aggressive, violent and extremely mobile task organization in the Infantry brigade commander's arsenal, but it must be used with the utmost precision and timing. Only through expert planning and flawless execution that is the product of hard realistic training of the entire combined arms team, can this be achieved. Like any team of college all-stars brought together for the *big* game, they are just a bunch of headline grabbers, unless they are brought under the scrutiny of their Olympic coach and made to work toward a common team goal.

* Combat Aviation Party is part of the Combat Aviation Management System used in the 101st Airborne Division (Air Assault) and is usually comprised of one commissioned officer (CPT/LT) aviator and several pathfinders from the pathfinder company. They are sent down to battalion level to assist the commander and his staff in the planning and execution of Aviation missions. The CAP is unique to the 101st Airborne Division and does not exist in other Army organizations.

ABOUT THE AUTHOR

CPT Murphy received his bachelor of science degree in business management at St. Peter's College in Jersey City, NJ, where he was commissioned out of ROTC in May 1980. He has received his master's of business administration from Embry-Riddle Aeronautical University and has attended the Armor Officer Basic Course, the Motor Officer Course, IERW, the AH-1S Qualification Course and Air Assault School. He was assigned as an attack helicopter platoon leader with Bravo Company, 229th Attack Helicopter Battalion, 101st Airborne Division (Air Assault), Ft. Campbell, KY, when he wrote this article. He is currently attending the Aviation Officer Advanced Course.

Can you identify the armament on these aircraft? See page 15.

AIRCRAFT ARMAMENT MAINTENANCE TECHNICIAN COURSE

CW3 Richard T. Michael Jr.

CW3 Michael is assigned to the Department of Aviation Trades Training, U. S. Army Aviation Logistics School, Ft. Eustis, VA, as an instructor. CW3 Michael is a senior aviator, an AMOC graduate, and an AH-1 and UH-1 Test Pilot Course graduate. He was one of three warrant officers that developed the Aircraft Armament Maintenance Technician Course. CW3 Michael has served in numerous Aviation logistics assignments in Vietnam and Germany, as well as in the continental United States.

THE MISSION OF the U. S. Army Aviation Logistics School is to assist in preparing the Army for the next conflict by increasing its ability to support the war fighting capability and by modernization of the force. The school accomplishes this by conducting resident training in Aviation logistics, professional and technical military occupational specialties for the U. S. Army, other U. S. Forces, Allied armed forces and selected civilian personnel, to ensure the force is populated with well trained, highly motivated soldiers and leaders.

The Aircraft Armament Maintenance Technician Course (AAMTC), a branch of the Aircraft Armament and Electrical Division of the Department of Aviation Trades Training, is in the fourth year of its existence. The essential training acquired through AAMTC helps provide those forces mentioned with the highly motivated leaders/technicians needed to maintain the AH-1S Cobra attack helicopter,

and all of its variants, in a high state of armament readiness.

During the last 30 years the Army's armed helicopters have progressed from the OH-23 Raven and OH-13 Sioux to systems of integrated circuit microcomputers, seven different ones to be exact, contained presently within a fully Modernized AH-1 Cobra. The total system has progressed to what in a time of "buzz words" must be considered a "smart" system. In other words, any flight control adjustments that were previously required to acquire ballistic accuracy are now accomplished electronically: The black boxes do the work. This is not to say that the crew's task of weapons delivery has been made simple; accuracy previously achieved through aerodynamic Kentucky windage is now computed electronically. This presents the pilot and copilot/gunner with a precise fire control reticle presentation that effectively improves accuracy of turret and rocket systems. The existing acquisition capabilities are also enhanced for TOW missile delivery, using the helmet sight subsystem and the airborne laser tracker.

A Modernized Cobra is the operational platform for multiple microcomputers, all of which are designed for enhanced armament delivery. For the armament technician, the conceptual approach to armament system maintenance has been diversified. The line replaceable unit (LRU) concept consists of removal and replacement at the unit level and transfer of the black box component to the Aviation intermediate maintenance (AVIM) level. If not repairable at AVIM, the component is forwarded to depot for repair. AVIM unit repairmen use diagnostic equipment to test these LRUs. The continuing process fault-isolates the individual LRU to a subcomponent of the LRU; that being either a circuit card assembly, chassis assembly or power supply module. These subcomponents are termed shop replaceable units. This concept is designed to use the skills taught to the maintenance personnel and to decrease downtime for the user.

When the first sophisticated armament system, the TOW missile system, was placed on the AH-1 airframe in the early 1970s, it quickly became apparent that additional armament repair personnel would be required to maintain the total system. The Army was quick to recognize the need for adjustments to Modified Tables of Organization and Equipment and personnel strength. Ironically, during this timeframe the ordnance training facility at Aberdeen Proving Grounds, MD, was in the process of transferring its Aviation armament military occupational specialty training to Ft. Eustis, VA. During this transfer the Aviation Armament Officer Course was discontinued. Varying policies would bring users to bear witness to an attack helicopter force trying desperately to grow with technology, but being stifled by economics and defense spending. Therefore, there is diversity present within today's attack helicopter force.

The fielding of the Modernized Cobra in 1980 would soon make it apparent that technology had vastly progressed to a level that required armament officer training, which then was nonexistent. Fortunately, concerned commanders effected the recreation of an Armament Officer Course.

To date the Aircraft Armament Maintenance Technician Course has held 37 classes, training 216 Regular Army, Reserve and National Guard warrant officers, 3 commissioned officers, 8 Allied students and 6 Department of the Army civilian technicians. Although the course is designed for attack helicopter pilots (100E) and Aviation maintenance officers (160A), anyone requiring training has been accommodated.

The AAMTC pronounced "AMTEC" by some, is a unique offering in military schooling. After all, where does one learn basic electricity, AC/DC circuits, the use of electronic troubleshooting tools, digital multimeters, oscilloscopes; progress through every armament system onboard the AH-1S and learn use and maintenance of the test sets required for troubleshooting?

A synopsis of the course after basic electronics displays a roller coaster ride between the Modernized Cobra (MC) and the Enhanced Cobra Armament System (ECAS) with its modernized peculiar components; and the Modified Cobra/Production Cobra. General subjects, safety, maintenance practices and procedures are followed by basic electricity, electronics and computer training. During the first week of general subjects, students are issued a general mechanic's toolbox which they use frequently during this course.

Although AR 611-112's description of a 100EE/160AE is that of a supervisor, it certainly is less difficult to supervise a task after having accomplished that task personally. Example: Imagine using an AN/USM 281-C oscilloscope to troubleshoot an XM143 heads-up display (HUD) test set for a Y deflection sine wave, and not being familiar with an O-scope—or supervising someone using a bore erosion gauge for a 20 mm cannon on the MC and ECAS aircraft.

Next in the series of seven subject matter areas are the helmet sight subsystem, M128/XM136 and TOW missile system, M65. Preparatory lessons and acquired skills of using digital multimeters, oscilloscopes and other diagnostic equipment are put into practice. Additionally students are

given an introduction to laser rangefinders, and airborne laser trackers.

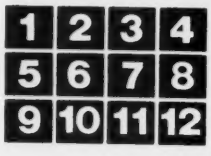
Every subsystem has a test set and the maintenance and troubleshooting of that test set is taught. Particularly for the test set guided missile system, an elaborate procedure is followed.

TOW is found on all "S" model Cobra series helicopters. Perhaps in the Cobra fleet we must consider the Modernized to be the thoroughbred, and all others hybrids. This diversification must be dealt with to accomplish our mission. Training, therefore, continues with the fire control systems of the Modernized Cobra, the XM76 heads-up display and XM22 fire control computer (FCC). Then a short interlude is taken from microprocessors as the wing stores segment brings into play the ancient art of soldering wires, while testing and repairing rocket intervalometers. Wrench turning also takes place as M200 and M158 pods are repaired and rewired. Winding up this segment is an exposure to an ECAS/MC subsystem and the rocket management subsystem (RMS) XM138. The RMS is essentially another fire control device that on the MC interfaces with the HUD and FCC; it also functions as the 2.75 inch rocket's fire control system on the ECAS model AH-1S.

Turret systems follow the fire control and wing stores/RMS segments. Training is accomplished on both the M97 universal turret system and the M28 turret. Due to the enormous interface with other armament subsystems, aircraft control panels and acquisition devices, extensive troubleshooting procedures are taught, requiring the use of diagnostic equipment, test sets, wiring schematics and a general mechanic's toolbox. The practical exercise portion involves wrench-bending during the mechanical assembly and disassembly session, leaving everyone with greasy hands, reeking of banana scented breakfree and satisfied with their exposure to these systems.

The final week is spent learning the boresight procedures required for the MC, using the boresight alignment ground support equipment. Trainer aircraft, in effect, undergo a complete checkout. Components found to be faulty are replaced or repaired. Should a test set malfunction it would undergo the required troubleshooting procedures and be repaired.

The AH-64 Apache presents a grandiose extension to Army Aviation's present attack helicopter force, the presence of which hallmarks future training objectives. The Aircraft Armament Maintenance Technician Course will meet this training challenge with enthusiasm.



Armament identification from page 13.

1. OH-13 with two .50 caliber machineguns and four Oerlikon 8 cm fixed fin rockets.
2. CH-34 with 4.5 inch rockets and fittings for two .50 caliber machineguns.
3. CH-34 with the XM4 kit: two 2.75 inch rocket pods.
4. CH-21 with 4.5 inch rocket kit.
5. UH-1 with the M22 missile system: SS11 rockets.
6. UH-1 with the XM26 armament system: TOW missiles.
7. UH-1 with the XM3 and M5 combined armament systems: 2.75 inch rockets on the sides and one M75 40 mm grenade launcher on the nose.
8. UH-1 with the XM159 armament system: 2.75 inch rocket launcher.
9. UH-1 with the XM6E3 armament system: four 7.62 mm machineguns.
10. AH-1G with four M159 2.75 inch rocket launchers and XM28 turret.
11. AH-1S with XM193 turret with XM197 20 mm gun, XM200 2.75 inch rocket launchers and XM65 TOW launchers.
12. AH-64 with M230E1 30 mm gun, XM261 2.75 inch rocket launchers and HELLFIRE missile launchers.

Ten Commandments for Technicians

Reprinted courtesy of *Mech.*
Submitted by AS1(SW) Armand Rubbo, USN
NAVMASSO Code 434, NAS Norfolk, VA

WHILE I cannot take credit for composing the following commandments (the source is but a yellowed clipping in my Zulu file), they are nevertheless still applicable to those who dabble or attempt to do so in electricity/electronics ("TRONS," to us AS ground pounders). I've altered it a bit to have it reflect the aviation maintenance environment. — A. Rubbo.

I Beware the lightning that lurketh in the undischarged capacitor, lest it cause thee to bounce upon thy buttocks in a most untechnician-like manner.

II Cause thou the switch that supplieth large quantities of juice to be opened and thusly tagged, that thy days in this earthly veil of tears may be long.

III Prove to thyself that all circuits that radiateth and upon which thou worketh are grounded and thusly tagged lest they lift thee to radio frequency potential and causeth thee also to make like a radiator.

IV Tarry not amongst those fools who engageth in intentional shocks for they are surely non-believers and are not long for this world.

V Take care that thou useth the proper method when thou takest the measure of voltage circuits lest thou incinerate both thyself and thy meter for verily, though thou hast no stock number and can easily be surveyed, the test meter doth have one and, as a consequence, bringeth much woe unto the supply officer.

VI Take care that thou tampereth not with safety devices and interlocks, for this incurreth the wrath of thy supervisor and bringeth the fury of thy safety officer upon thy head and shoulders.

VII Work thou not on energized equipment for if thou dost, thy friends will surely buy beers for thy widow and console her in other ways.

VIII Service thou not equipment for electrical cooking: It is a slothful process and thou might sizzle in thine own fat upon a hot circuit for hours before thy Maker sees fit to end thy misery.

IX Trifle thou not with radioactive tubes and like substances lest thou commence to glow in the dark like a lightning bug and thy spouse have no further use for thee except thy paycheck.

X Thou shalt not make unauthorized modifications to equipment, but causeth thou to be recorded all technical directives and authorized modifications made by thee, lest thy successor tear his hair and go slowly mad in his attempt to decide what manner of creature hath made a nest in the wiring of such equipment.

XI (Optional but should be mandatory)
Thou shalt learn and maintain proficiency in CPR, lest thy buddy violate the Commandments, that thou may offer the Breath of Life and cause him to return to good health, thereby causing thy personnel officer much joy in that he hath not a service record to close out.

Aviation Litmus Evaluation Risk Test

Major(P) Kenneth O. Boley
U.S. Army Safety Center
Fort Rucker, AL

U.S. ARMY SAFETY CENTER

The process described in this article is intended to assist commanders in assessing risk involved in aviation operations. The views expressed are those of the author and are not necessarily those of the Department of the Army or the Army Safety Center.

About the Author

Major(P) Kenneth O. Boley is currently serving as the Army National Guard Liaison Officer to the United States Army Safety Center. In addition to being a dual-rated Master Army Aviator and a 1981 graduate of the Command and General Staff College, he holds post graduate degrees in education and management. Major Boley has had experience as a safety officer in unit through MACOM-level assignments.

THE ARMY HAS ADOPTED the concept of risk management as an integral part of its accident prevention policy. **Risk management** is the term used to describe the systematic process by which risks inherent in an operation are first minimized and then reconciled with essential mission needs. As a result, safety and mission never conflict; rather, they blend together to produce optimum results.

At present, the Army Aviation community has no adequate means of measuring the risks involved in Aviation operations. The current process, for the most part, is a subjective assessment of hazards. Many in the Aviation profession quietly harbor the belief that accidents are the unavoidable cost of doing business in an intrinsically dangerous profession.

What is needed is a quick test, a litmus test, to measure the risks associated with the wide spectrum of Aviation missions. Aviation unit commanders, ground commanders, air mission commanders, operations officers, and pilots in command need a tool to measure risk. The Aviation Litmus Evaluation Risk Test (ALERT) is designed to evaluate the probability and magnitude of adverse effect. Six elements—supervision, planning, crew selection, crew endurance, weather, and mission complexity—are central to safe completion of any Aviation operation. Developing a graduated risk matrix for each of the six elements would allow a numerical assessment to be assigned to risk.

Supervision. The level of supervision is assessed by comparing mission type to command control. Support, NOE and NVG are seen as graduated risk mission parameters. Support includes routine VMC/IMC missions flown by the Aviation unit. Command control ranges from total Aviation supervision to Aviation assets being placed under the operational control of nonaviation organizations. The ground relationship is viewed as one characterized by Aviation in direct support of the ground commander.

Supervision

Command Control	Risk Value: Mission		
	Support	NOE	NVG
OPCON	3	4	5
Ground	2	3	4
Aviation	1	2	3

Example: An OPCON mission such as a helicopter static display would receive a risk assessment factor of 3.

Planning. The planning element is assessed by comparing guidance to preparation. Precise guidance and an extended time for preparation are seen as optimal.

Planning

Guidance	Risk Value: Preparation		
	In-depth	Adequate	Minimal
Vague	3	4	5
Implied	2	3	4
Specific	1	2	3

Crew Selection. Crew selection is assessed by comparing aircraft mission with total crew experience. Total flight hours coupled with currency are seen as a valid indication of experience. Individual strengths and weaknesses can be blended and assessed by the authority tasked with crew selection.

Crew Selection

Aircraft Mission	Risk Value: Total Crew Experience		
	2,000 hrs	1,500 hrs	750 hrs
Observation	3	4	5
Attack	2	3	4
Utility	1	2	3

Note: Single-pilot missions are factored by dividing total crew experience by one-half.

Crew Endurance. Crew endurance is assessed by comparing the quality of rest to the length of rest. The unit environment is preferable in quality to the training or tactical environment. Local crew endurance policies would be used to factor length of rest.

Crew Endurance

Quality of Rest	Risk Value: Length of Rest		
	Optimum	Adequate	Minimal
Tactical	3	4	5
Training	2	3	4
Unit	1	2	3

Weather. Weather is assessed by comparing wind velocity with ceiling and visibility. Minimums are defined as the lowest ceiling and visibility allowed by appropriate directive for the mission.

Weather

Wind Velocity (Knots)	Risk Value: Ceiling/Visibility		
	Clear	VFR (1,000-3)	Minimums
30	3	4	5
20	2	3	4
10	1	2	3

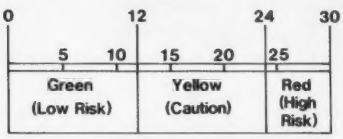
Complexity. Complexity is assessed by considering both total flight time and landing area. A total flight time of 6 hours would require multiple landings and fuel stops for a helicopter. Suitability of landing area would be factored by the number of aircraft in contrast to the size and obstacles in the touchdown area.

Complexity

Flight Time	Risk Value: Landing Area		
	Improved	Tactical	Unknown
6 Hours	3	4	5
4 Hours	2	3	4
2 Hours	1	2	3

After all risks have been assessed, the values would be totaled and applied to the quick reference litmus test.

ALERT



Operations with a value of 0 to 12 are judged as **low risk.** A value of 13 to 23 is seen as a **caution** area; complete unit command involvement is warranted. **High risk** operations assigned a value of 24 to 30 require coordination, before flying the mission, with the next higher level of command external to the organization making the assessment. Any person detecting an unsafe act or condition is authorized to abort the mission during noncombat operations.

To demonstrate the use of ALERT, let's look at two scenarios involving a routine static helicopter display mission. We'll vary only the assessment elements.

Scenario 1		
Element	**Risk Value**	**Assessment Elements**
Supervision	3	Mission is categorized as OPCON/support.
Planning	1	Guidance is quite specific; extended amount of preparation time is available.
Crew selection	1	Utility mission; 4,700 hours of experience on board.
Crew endurance	1	Organization is in garrison and is fully rested.
Weather	1	Weather en route and at display site is clear; wind is from the north at 8 knots.
Complexity	1	Display site is 50 NM away; site is located on a civilian airfield with crash rescue support.
ALERT value =	8	Well within the low-risk zone.
Scenario 2		
Element	**Risk Value**	**Assessment Elements**
Supervision	3	Mission is categorized as OPCON/support.
Planning	5	Due to administrative oversight, request for static display arrives late at unit; confusion exists as to exact tasking.
Crew selection	3	Utility mission; 725 hours of experience on board.
Crew endurance	5	Unit has just returned from a demanding field training exercise.
Weather	4	Weather en route is marginal VFR; destination forecast at time of arrival is 1,000 overcast with 3 miles visibility; winds are out of the south at 22 knots.
Complexity	5	Six hours of flight time are required to support the mission; site is located at a shopping center; exact size of and obstructions at site are unknown.
ALERT value =	25	High-risk mission.

We have just looked at the same mission with a different set of elements to factor. The point is that without ALERT, scenario 2 might have been flown under the guise of, "It feels good; let's do it." Conversely, it is not to be construed that scenario 1 should be flown with an absence of supervision.

The ALERT process challenges Aviation organizations to refine and adopt the basic assessment elements. Since the risk elements are arbitrary in nature, individual units could develop additional matrix charts that blend in special considerations. One idea that would be incorporated is the level of risk multiplier factors. The multiplier factor is a predetermined numerical value used to adjust the matrix chart data for special considerations. An example of such special considerations would be a mission involving NOE flying with slingloads while using NVG. One caution—keep the process simple. The idea is to develop a quick test for the level of risk.

Now more than ever before, the Aviation commander is responsible for overall training and employment of his Aviation assets. Risk management is a means by which the commander can be better prepared to assist the ground commander in accomplishing his mission. Accident prevention must be made a part of every action and task performed in Army Aviation. Paramount to the overall Aviation safety program is the ability to measure risk.

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Vickie Wall photo by Reflections Studio

Aviation Survival Schools Update

We refer you to the article in the April 1985 issue of *Aviation Digest* entitled "Aviation Survival Schools." Responses received from that article were inadequate. We know there are many more schools out there than those received; therefore, we would like to extend to everyone another opportunity to respond. If you are currently conducting, or know of someone who is conducting Aviation survival training, we would like to know about it so we can compile a list from which Aviation unit trainers can select. The parameters for inclusion in this list are:

- Ongoing training (annual, semiannual, etc.), not just a one time thing.
- Open to all Active Army, Army Reserves and National Guard.
- Billeting and mess facilities available (i.e. quarters, hotels, restaurants nearby) for personnel attending the course.
- Bonifide program of instruction.

This information should be submitted not later than 30 November 1985 to Mr. James Angelos, AMSAV-MCAPS, AUTOVON 693-3889, FTS 273-3889 or Commercial (314) 263-3889. You may also write c/o PEARL'S, AMCPM-ALSE (Prov), 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798, to have your survival training included in a catalog of survival schools.

If you have a question about personal equipment or rescue/survival gear, write PEARL, AMC Project Officer, ATTN: AMCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-1218/9 or Commercial 314-263-1218/9.

GOAL—
$2,500,000

August 1985—
$1,750,000
cash and pledges

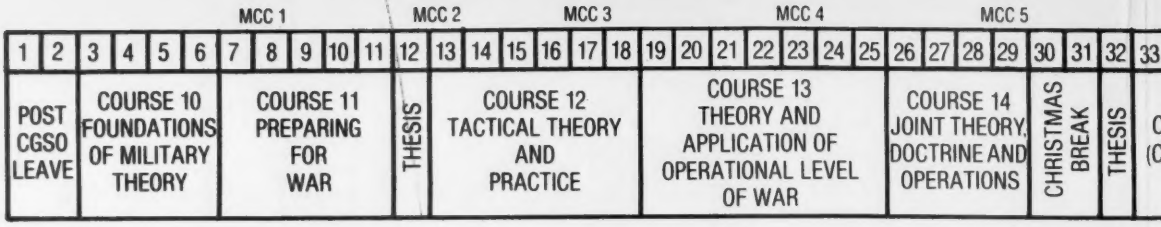
Army Aviation MUSEUM

This is a series about the Army Aviation Museum Foundation fund drive. Currently, plans call for building a modern complex to house your Army Aviation Museum. Since last month additional donations have been received. However, we still have a ways to go, as the barometer above shows. If you would like to help "build" the Army Aviation Museum's new home, you are invited to send a tax deductible contribution to: The Army Aviation Museum Foundation, Box 610, Ft. Rucker, AL 36362-5000. If you desire additional information call Mr. Ed Brown at (205) 598-2508.

A Look At What's In Your Museum

Between 1973-1976 the Army conducted an advanced attack helicopter competition. Phase I of the competition was to develop an attack helicopter for antiarmor operations in day, night and adverse conditions with the capability of the helicopter to be based with front line troops. Both Hughes and Bell entered the competition in September 1975. In May 1976 two flying prototypes were delivered to the Army for evaluation. On 10 December 1976 the U.S. Army selected the Hughes design and awarded a contract to begin a full-scale engineering development program, commencing in 1977. Phase II included the construction of three more prototypes equipped with avionics, visionics and a fire control system for all five prototypes.

The AH-64A is a twin engine, two-place attack helicopter that is equipped with sophisticated avionics, a Target Acquisition Designation System / Pilot's Night Vision System that uses optics, infrared, television and a laser designation, tracking and range-finding system. Mounted beneath the aircraft is a 30-mm chain gun with wing stubs that provide for a variety of ordnance including 16 HELLFIRE missiles or 76, 2.75 inch rockets in 4 pods. The Hughes YAH-64A number 2 flying prototype presently on display was transferred to the U.S. Army Aviation Museum in May 1985 with a dedication ceremony held 14 June 1985.


MCC 1
MCC 2
MCC 3
MCC 4
MCC 5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
POST CGSO LEAVE
COURSE 10 FOUNDATIONS OF MILITARY THEORY
COURSE 11 PREPARING FOR WAR
THESIS
COURSE 12 TACTICAL THEORY AND PRACTICE
COURSE 13 THEORY AND APPLICATION OF OPERATIONAL LEVEL OF WAR
COURSE 14 JOINT THEORY, DOCTRINE AND OPERATIONS
CHRISTMAS BREAK
THESIS

Can You Meet The Challenge?

CONSIDER THIS—
- **Our staff college training is austere—no two ways about it!**
- **Look at all of the other first-rate armies of the world.**

THE ISRAELIS send their staff college selectees to 46 weeks of school, supplemented with 9 additional weeks for those chosen to command battalions. The Canadians send all officers to a 20-week staff course and a selected minority to 45 weeks of preparation for service on higher level staffs. The British and Germans each devote about 100 weeks, while the Russians put their potential general staff officers through an astonishing 150 weeks of intensive education. All of this is in sharp contrast to the United States' modest 42 weeks of command and general staff officer (CGSO) instruction and 9 weeks of Combined Arms and Services Staff School.

Yet we have the world's toughest missions—with no special qualities or alternate systems of officer education and training to offset our comparative shortcoming in staff college training. To further aggravate this posture, our normal assignment policies (high turnover rates), rapid promotions and short careers (20-year retirement) when compared to the Armies of other countries, do not permit our officers to build as wide an experiential base.

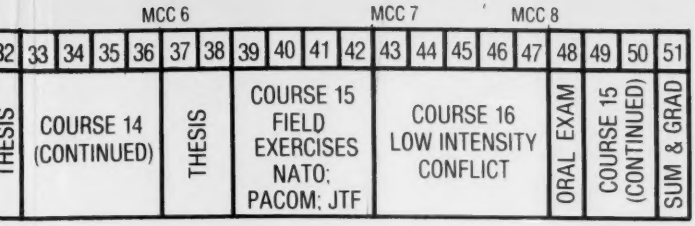
To fill this disparate void, the Advanced Military Studies Program (AMSP) was formed. Established by the commander, U.S. Army Training and Doctrine Command on 28 December 1982, the AMSP adds an approximate 1-year course of instruction to the CGSO course for selected students. This approval stemmed from a growing realization that 1 year of instruction was not sufficient to educate all field grade officers who will occupy critical command and staff positions in peace and war.

Graduates of this course are highly selected members of their peer group with unusual growth potential. They also are bright, selfless and thoroughly competent team players with unusual commitments to full 30-year careers. The additional schooling they receive beyond the CGSO course gives them a broad perspective, a flexible and creative approach to problem-solving, and the inner confidence and drive to solve the most difficult and complex problems.

This growth in knowledge during the course improves the students' judgments about a wide variety of military concerns focused at the tactical and operational levels. They:

- **Gain a theoretical understanding of current combined arms doctrine.**
- **Understand the application of doctrine to all possible near-term U.S. Army missions.**
- **Learn how to adapt current methods and techniques to new conditions.**
- **Have a working-level knowledge of all combined arms at battalion, brigade, division and corps.**
- **Know how Army operations fit into the joint and combined context.**

Major General Ellis D. Parker
Commander
U.S. Army Aviation Center
Fort Rucker, AL


MCC 6
MCC 7
MCC 8
32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
THESIS
COURSE 14 (CONTINUED)
THESIS
COURSE 15 FIELD EXERCISES NATO; PACOM; JTF
COURSE 16 LOW INTENSITY CONFLICT
ORAL EXAM
COURSE 15 (CONTINUED)
SUM & GRAD

Advanced Military Studies Program

• Understand the theory and application of the operational level of war.

• Have a working familiarity with the strategic context.

• Understand how the total Army works.

• Are familiar with near-term new technology and its applications.

Upon graduation, they:

• Bring to their duties (which may essentially be the same as other CGSO course graduates) a wider contextual perspective to problem-solving.

• Are better tacticians.

• Are better at solving the everyday tough problems.

• Are more at home on the higher-level operational staffs.

• Are able to bring to their duties a tough-minded and creative flexibility for dealing with complex ***new*** problems and the problems inherent in change.

• Are better ***teachers***.

The extended portion to the CGSO course begins about 3 weeks after the regular course graduation and lasts through May of the following year. The curriculum consists of a core course, a thesis requirement, a series of military classics colloquiums (MCC) and a discussion program with an eminent guest.

Students are required to produce a master's thesis leading to a master of military arts and sciences degree. They also must defend their theses before a thesis committee, and they are required to pass a comprehensive oral examination at the conclusion of the course.

Above is a graphic portrayal of the AMSP.

The core course provides the major focus for the program and consists of seven subcourses:

• Foundations in Military Theory

• Preparing for War

• Tactical Theory and Practice

• Theory and Application of the Operational Level of War

• Theater Operations

• Field Exercise Applications: North Atlantic Treaty Organization (NATO), Pacific Command (PACOM) and Central Army Command (CENTCOM)

• Low Intensity Conflict.

These are explained further:

Military Classics Colloquiums: To provide a broad background in the history of warfare. To know where one has been is an aid to looking ahead. Eight MCCs are scheduled throughout the year. (These are labeled MCC 1 through MCC 8 on the above chart.)

Foundations in Military Theory (Week 3 through 6): To teach the students "how" to think about war as opposed to "what" to think about war. It develops a capacity for innovative, creative and forward-looking thinking about military affairs.

Preparing For War (Week 7 through 11): To develop indepth knowledge and understanding of the fundamental tasks the Army must perform in preparing for war, with an emphasis on

those activities that directly enhance combat effectiveness.

Tactical Theory and Practice (Week 13 through 18): While reinforcing fundamental Command and General Staff College knowledge, this subcourse teaches abstract reasoning about the dynamics of engagements and battles—the tactical level of war. This course encourages creative, forward-looking tactical thinking based on sound principles and a thorough knowledge of soldiers and hardware.

Theory and Application of Operational Level of War (Week 19 through 25): During the CGSO course, students are introduced to war at the operational level. This subcourse develops the students' ability to think and plan at the operational level, to develop a deeper understanding of the theory and practice of combined arms operations at the operational level, and (through an examination of history) to develop a basis for projecting the form of future operations. Students examine the theory behind the conduct of war at the operational level and observe doctrinal methods and functions in action under different national contexts. Students review effects of technological change and understand its impact upon doctrine. They examine the lessons of six World War II campaigns with a view to examine and question the applicability of these lessons to the present and future.

Theater Operations (Week 26 through 36): To develop an understanding of the character of military campaigns at the theater level and its impact on the conduct of combined arms operations.

Field Applications: NATO, PACOM AND CENTCOM (Week 39 through 42 + 49-50): Examine the application of theory learned thus far to operations in NATO, PACOM and CENTCOM theaters of war and to further deepen the understanding of practical methods and techniques used in the conduct of operations in the current contexts.

Low-Intensity Conflict (Week 43 through 47): The majority of the AMSP curriculum to this point has examined mid- and high-intensity conflict. This subcourse examines the lower end of the scale of violence and provides the students with an indepth knowledge of the theory, doctrine and application techniques for the lower intensity scale of armed conflict, ranging from foreign military assistance to active counterinsurgency measures.

As delineated above, this is not a course of instruction to be taken lightly. The traits earlier identified as necessary for selection are those traits which will be maximized and built upon after graduation from AMSP.

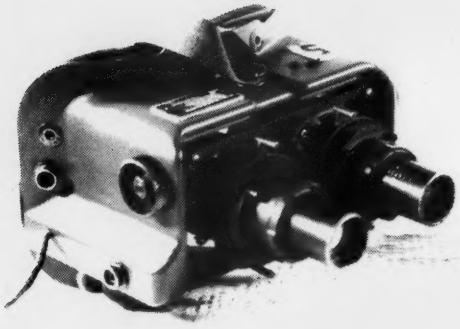
Additionally, it is not the intent of AMSP to create an elite corps of officers who will receive special assignments and more rapid advancement. They, like all other officers, must rise based on sustained demonstration of outstanding performance in the field. They will not comprise a new elite shadow "general staff" and there will be no skill identifier to single them out.

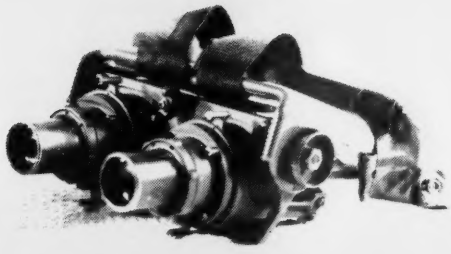
I wholeheartedly support this critical program as it will indeed ameliorate training for our commanders and staff officers of tomorrow.

If you think that you can make the cut and meet the challenge of not only the AMSP, but also the jobs for which it prepares you—apply. These are the eligibility criteria:

- Resident student of the Command and General Staff Officers' Course as of date of application.
- Grade of captain (P), major or major (P) as of date of application.
- Meet Department of the Army height and weight standards.
- Successfully pass the Army physical readiness test within the last 6 months.

The Aviation Branch point of contact is Major Paul DesJardins, AUTOVON 558-3423/5706, FTS 533-3423/5706 and Commercial (205) 255-3423/5706.





A LITTLE DIRT CAN HURT

or Everything You Thought You Already Knew About Lens Care

Captain Jim E. Fulbrook, Ph.D.
Aviation Training Brigade
U.S. Army Aviation Center
Fort Rucker, AL

IN MY LAST assignment I was a research scientist at the U.S. Army Aeromedical Research Laboratory (USAARL). Aside from in-house laboratory research for the soldier, I was also involved in consultant work to evaluate changes in cockpit designs and lighting for greater compatibility with night vision goggles (NVG). To keep pace with the developments and changes in NVG operations and cockpit configurations, several investigators at USAARL participated as technical observers. They tagged along with different instructor pilot qualification course training groups for NVG instructor pilots in both UH-1 Huey and OH-58 Kiowa aircraft at Ft. Rucker, AL, the home of Army Aviation and the heart of air assault!

For the last couple of years, familiarization with NVG training and operations has been one of my more enjoyable, exciting and educational "extra duties." Interestingly, every time I went flying with an NVG training group, I encountered aviators who would incorrectly and abusively attempt to clean the glass lenses of their night vision goggles. The most common culprits are the people who sit with the NVG in their laps, during the preflight briefing, occasionally breathing hot air through their mouths onto the lenses to apply condensed moisture, then unwittingly massaging each lens in a circular motion with a single sheet of lens paper for an excessive period of time.

With some aviators cleaning lenses appears to be done in almost a semiconscious manner. Others occasionally fail to inspect the lenses of their NVG altogether; but, it's that excessive rubbing with the same section of lens paper that causes my hair to curl. So, I felt compelled to write this short article to remind everyone who uses viewing devices with glass lenses of the proper cleaning procedure and care.

A lens is a simple optical device which directs transmitted rays of light from object to image at specific focal lengths on both sides of its surface. The power a lens has to converge or diverge rays of light is determined by the curved surfaces on either side of the lens and the lens material. More important, however, maintaining a brilliant, high fidelity image through the lens is dependent on the optical surface's quality and its cleanliness. Also, the external surfaces of many lenses have added layers or coating materials to reduce reflection and filter unwanted light. Usually, these layers are about as hard and durable as the glass itself, but all are sensitive to scratches and must be treated with care.

Aside from dirt and scratches, a lens surface is vulnerable to etching from acids or other strong based substances.

A LITTLE DIRT CAN HURT

There are people who supposedly have sweat of a sufficient acidic level to etch glass if their fingerprints are left on the lens' surface long enough. The main problem from touching the lens' surface, however, is not acid etching but the simple depositing of dirt and grease. Dirt, grease, etching and scratches can all degrade the image transmission through a lens. Once a lens surface is etched or scratched, it generally cannot be restored.

Lenses are frequently scratched against the seat belt and shoulder harness assembly when allowed to dangle too low from the neck cord. NVG lenses also can be easily scratched against overhead cockpit components in some aircraft when the goggles are carried on top of the helmet. Whenever NVG are not in use they should be carefully and safely stowed and, when practical, with the lens caps on. Treat your NVG lenses better than you would your personal camera lens—your life could depend on the NVG.

The surfaces of lenses always should be checked to be clean and dust-free before use to ensure optimal imaging system performance. Remember, though, if proper caution is taken when using NVG, the lenses should only need occasional cleaning. Where lenses are concerned, an analogy to the adage, "If it ain't broke, don't fix it!" becomes: "If it ain't dirty, don't clean it!"

Checking a lens for dirt, grease and scratches is rather straightforward and is best done by rotating the lens in many directions, while viewing the light reflected off the lens from a fairly intense light source. Image focusing is done throughout the glass lens surface. Small amounts of dust or dirt on the outside edge of the lens area are not significant and do not make cleaning necessary if the lens itself appears to be unobstructed.

Lenses must be checked and cleaned before use and, whenever possible, inspected and cleaned again after use. Any excessive scratches, defects or stubborn smudges on the surfaces of the lenses should be reported to the Aviation life support equipment (ALSE) shop or issuing and maintenance personnel. Lenses should be cleaned only with a nonabrasive, dust-free material. A standard lens paper should be readily available from your unit ALSE or supply shop (NSN 6650-00-240-5851). Paper towels, facial or toilet tissue, handkerchiefs, t-shirts and shirt sleeves should not be used to clean lenses! Aside from the dust and abrasiveness of some materials, many potential cleaning cloths or papers can build up static on the lens causing it to collect more dust particles than it may have already had. This is especially true when the ambient temperature or humidity is very low. While the information given here can be applied to general lens care, a primary purpose of this article is to review the proper cleaning procedure for the lenses of the two current generations of night vision goggles fielded in today's Army. A review of the instructions from each operator's manual pertinent to lens care is given below, followed by some clarification of the procedures.

The current operator's manual for the AN/PVS-5 series night vision goggles is TM 11-5855-238-10, dated October 1981. Lens cleaning instructions are given in paragraph 3-1, on page 40, which essentially lists the following steps:

1. Carefully remove all loose dirt from the lenses with lens paper.

2. Using clean water, dampen a folded lens paper.

3. Lightly and slowly wipe the lens. After one straight stroke, discard the lens paper.

. . . if proper caution is taken . . . the lenses should only need occasional cleaning . . . "If it ain't dirty, don't clean it!"

4. Repeat this procedure until the glass surfaces are clean.

In addition, a caution is given on page 37 warning that operation in dusty or sandy areas can cause pitting and scratching of optical elements. You should avoid pointing the goggles into the wind unless it is absolutely necessary for operation.

The current AN/AVS-6 (ANVIS) operator's manual is TM 11-5855-263-10, dated 5 July 1983. Under preoperational checks you are instructed to inspect the objective and eyepiece lenses for dirt, dust, fingerprints, scratches, chips or cracks (paragraph 2-9, page 2-10). If necessary, clean and dry lenses using clean water and lens paper. The ANVIS manual also gives warning to avoid pointing the binocular into the wind during dusty or sandy conditions to prevent lens damage (page 2-79). When cleaning lenses in dusty or sandy conditions, you are warned to be especially careful not to rub hard on the external lenses with the lens paper.

Specific instructions in the ANVIS operator's manual for cleaning lenses are given in paragraph 3-1, on page 3-1, which initially cautions you not to scratch or touch the external lens surfaces. A series of steps then are given on cleaning the NVG and the lenses. The lens cleaning instructions are about the same as those given for the AN/PVS-5. Unfortunately, these instructions are not as clear as they could be. A clarification of this procedure is provided by following the steps and information given here.

- Carefully inspect both eyepiece and objective lenses in a well-lighted environment, looking for dirt, smudges, scratches or any potential image obstruction. Remember: If the lens ain't dirty, don't clean it!
- If the lens appears to be dusty and sandy blow on it first to remove as many particles as possible and reinspect.
- If cleaning with lens paper is necessary (using only the approved stuff), first try using it dry. Sweep *gently* and *lightly* across the lens in one straight stroke. If necessary, repeat once more by sweeping 90 degrees opposite the first pass (in an X pattern). Both manuals indicate that the folded lens paper should be discarded after each stroke, but the same sheet could be used for the pair of 90-degree sweeps, as long as a different section of the lens paper were used. Be careful to use clean lens paper, not pieces you smeared your grubby hands all over or paper that may have collected sand and dirt from careless storage.
- If the lens still is not clean, then lightly dampen another folded sheet of lens paper with clean water. If clean water is not readily available, then exhale deeply through your mouth onto the lens to condense moisture on it. Aviators are supposedly very adept at this type of heavy breathing. Do not lick, spit, slobber or drool on the lens, either. It's in poor taste and, at the very least, could get you ostracized by your fellow aviators. Once again, with the dampened paper or lens, sweep lightly and slowly in one straight stroke across the lens. If necessary, repeat again with a clean section of dampened paper with a straight sweep, 90 degrees opposite the first. Remember: Do not grind on the lens by using excessive pressure or circular motions when cleaning.
- Repeat this procedure until all glass surfaces are clean. Any potential obstructions on the lens that defy removal or appear permanent should be reported to the ALSE shop or issuing personnel *before operations*, if possible. All unit-level NVG shops should have test units to check the image-forming quality of each tube.

Note that some solvents such as denatured or isopropyl alcohol, mineral spirits and acetone are commonly used for cleaning lenses because they cut grease and evaporate quickly with little residue. Cleaning solvents, however, are not issued or authorized for lens cleaning purposes at the unit level even though they can be used safely by experienced personnel. Do not take chances by using cleaning solvents. Some can erode the seal between the glass lens and tube or possibly affect the lens' coatings. Stick to the clean water or condensed moisture from your breath.

Recently, a soft-hair brush was approved for unit ALSE shops to procure for use in lens care. Actually, the brush has been around for years as standard equipment with the night sight for rifles and is identified as NSN 7920-00-205-0565; brush, lens, dust. If available, the brush should be used before lens paper.

There are two minor discrepancies to point out with the operator's manuals. On page 16 of the AN/PVS-5 manual, under "Preventive Maintenance, Checks and Services," you are instructed to routinely check for lens cleaning compound in your NVG carrying case. However, cleaning compound is not a standard NVG equipment item. On page 3-2 of the AN/AVS-6 operator's manual, under "ANVIS Cleaning and Maintenance Procedures," you are instructed to use a lint-free cloth for general NVG cleaning. Here again is a reference to a specific item that is not in general issue nor identified for supplemental procurement.

One final point needs to be made about the general care of NVG. When the NVG tubes are manufactured, they are rigorously tested to ensure that each unit is completely sealed. If the NVG were accidentally dropped into mud or had some liquid spilled on them, the entire NVG could be washed safely under water. Of course, the sheepskin faceplate cushion should be removed and cleaned separately and immersion for excessive periods of time or in hot water would be pressing your luck, and is not recommended.

Inspecting and cleaning lenses may seem like a trivial pursuit, but it's really one of the more important preoperational checks for NVG operations that you can make. Optimal image quality is critical for safety of flight, viewing comfort and minimal fatigue. So, don't forget to check your lenses and don't overdo the cleaning.

That's it...Good goggling, Godspeed and air assault!

QUESTIONNAIRES

THE DIRECTORATE of Evaluation and Standardization (DES) recently implemented a graduate questionnaire program designed to evaluate the adequacy of courses taught at the U. S. Army Aviation Center, Ft. Rucker, AL. This program provides DES with a systematic and economical means of gathering data from units in the field. Several of you have already had an opportunity to respond to our questionnaires. Many more of you will find yourselves affected by this program as time goes on.

This last February we started mailing questionnaires to recent Initial Entry Rotary Wing graduates and their present field unit instructor pilots (IPs). Graduates of the Flight Operations Coordinator Course and their immediate supervisors were brought into the program in May. In June questionnaires began going out to recent graduates of the Fixed Wing Multi-Engine Qualification Course, the OV-1, AH-1, UH-60 and CH-47 Aviator Qualification Courses and the Rotary Wing Refresher Training Course. By the time this article is published, questionnaires also will be available for our Air Traffic Controller Course graduates and their supervisors.

Why are we doing this? The Aviation Center wants to train its students to fulfill the needs of units in the field in the most efficient and effective manner possible. To accomplish this goal, we must answer two fundamental questions:

- Are recent graduates able to perform the tasks and jobs for which they were trained?
- Are the tasks that we are training still relevant to the needs of the field?

The questionnaires provide an opportunity for us to focus in on answers to the above questions. The program we have just begun is a vital component of a process dedicated to the fine tuning of what are considered to be some of the best training programs of their kind anywhere.

We want to impress upon you the importance of your input. We recognize the potential benefits of this program to the Aviation Center and to Army Aviation in general. We also know the dangers of making unwarranted changes to our courses based upon invalid or incomplete data. We must, therefore, have your full support and participation. To encourage your participation, we have done our utmost to minimize the burden that the questionnaires will impose on you and your unit.

The questionnaires are comprised of two major sections. The first asks for some general background data relating to each graduate's current status in his or her unit. The second section contains a list of tasks that relate to the graduates' training. Graduates are asked to indicate how prepared they felt they were to perform the tasks, based upon their exposure to the tasks in the field. Unit IPs or supervisors are asked to indicate, based on their observations, how prepared the graduate was to perform each of the tasks in the unit.

None of our questionnaires are permitted to exceed 50 questions in length. In fact, the average number of questions that we have so far is only 42 for the graduate questionnaires and 39 for the IP/supervisor questionnaires. There are no fill-in-the-blank items nor are there any requests for essays. Respondents simply code in their responses on a machine readable answer card with a number two pencil. Time trials have assured us that no more than 20 minutes should be required to complete a questionnaire.

A fact that may ease the minds of many of you is that not everyone in the Army Aviation community is going to be surveyed. The program is structured around recent graduates and those individuals in the field who have the best opportunity to observe and judge their performance. For our graduate aviators this is the unit IP. For graduates of our enlisted courses this person is the graduates' immediate supervisor. Because this is a random sample, if you do not receive a questionnaire from us within 5 or 6 months after completing one of our training programs or (for you IPs and supervisors) after assignment of one of our brand new graduates to your unit,

Mr. William A. Rowe
Directorate of Evaluation and Standardization
U. S. Army Aviation Center
Fort Rucker, AL

you probably will not hear from us at all.

Only a small percentage of those who are eligible will actually receive a questionnaire while some IPs and supervisors may be surveyed more than once. This situation may happen only in rare circumstances when, by chance, we survey different graduates who have been assigned to the same unit. As a rule, however, almost everyone involved will have about a 90 percent chance of never receiving a questionnaire.

We would like those of you who already have participated and those of you who may participate in the future to know a bit more about the program you're assisting. We'll start with the process we follow to get the questionnaires into your hands and end with a general explanation of what we plan to do with all the information that you provide.

Our work starts 5 months after a class graduates from a program of instruction. At that time we *randomly select* the names of about 10 percent of the class from their graduation roster. The list of names is taken to a worldwide locator file where we obtain the current addresses of the selected individuals. We enter this information into our computer and it responds by printing out a graduate and IP or supervisor questionnaire for each person on the list.

The questionnaire material relating to each individual is organized into a packet and mailed to the appropriate unit commander. Each packet contains a cover letter to the commander, a graduate questionnaire, an IP or a supervisor questionnaire, two answer cards and two preaddressed return envelopes.

After mailing the packets we wait 15 working days for a response. If we do not hear from you by the end of that time period, we assume that the original packet was lost in the mail, that your questionnaire was stolen or that the post office delivered your response to the wrong address. Anyway, we give the process a second chance and mail you another questionnaire. So far, the response rate has been very encouraging.

As the answer cards accumulate, they are processed through a card reader and the data is fed directly into a computerized data base. We will analyze the data at a specified time in accordance with the study plan for each of the questionnaires. The questionnaire responses for the Initial Entry Rotary Wing course will be the first to be analyzed. This effort will begin in December. Thereafter, one course per month will be analyzed.

Quite frankly, what we do after the data are analyzed will depend upon the analyses findings. We may find that everything is perfect and should be left alone. At that point we will be able to direct our resources to our next project. On the other hand, the data may indicate that there are problems with a training program that deserve our attention. Based on the characteristics of the data, we may see a way to resolve a problem right away or we may have to conduct further study through onsite interviews or performance measurements, just to name a few of the many options. After the exact nature of the problem is determined, the trainers will be notified so the necessary changes can be made in the program of instruction. We will continue to send questionnaires to the field to monitor the adequacy of any changes that are made and to determine if any other problems develop.

In closing, we want to emphasize that the most important ingredient in the whole program is you. It does not really matter how polished the questionnaires are. It does not matter how sophisticated our analysis techniques become. If we do not have your complete cooperation and support there is little that can be done. We are counting on your input. If we all do our part, we may very well end up with even better training programs and graduates than we have right now.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5000; or call us at AUTOVON 558-3504, FTS 533-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or 205-255-6487 and leave a message.

U.S. Army Class A Aviation Flight Mishaps

	Number	Flying Hours (estimated)	Rate	Fatalities	Total Cost (in millions)
FY 84 (to 30 August)	35	1,379,353	2.54	32	$51.2
FY 85 (to 30 August)	44	1,360,538	3.23	29	$77.1

AVIATION PERSONNEL NOTES

Just the Facts

Do I have to have all top blocks checked by senior raters on my OERs to get promoted?

Definitely not. Of the officers selected by the 1984 colonels' and majors' promotion boards, about nine-tenths of the officers had at least one evaluation report less than the top block. Of those selected by the 1984 lieutenant colonels' board, almost half of the majors had at least half of their evaluation reports with less than top blocks. The senior rater's profile is key to how a board member evaluates a senior rater's check in a certain block on your reports.

Many of my junior officers are concerned about their OERs and their chances for promotion. What should I tell them?

All officers should keep informed on OER and promotion system developments. But focusing too much on OERs creates inappropriate anxieties and concerns, especially among our junior officers. This is the advice given by countless successful senior officers: "The formula or strategy for success in our system continues to be to do the best possible job with each task and mission assigned, remain dedicated and faithful to the mission and goals of the Army and parent organization, continue to develop and show concern for subordinates, and most important, enjoy each assignment." Adherence to this strategy clearly marks the outstanding officer, and success will invariably follow.

I came on active duty in the Delayed Entry Program (DEP). When I signed my contract, I was promised a certain enlistment bonus rate. It was lower when I came on active duty. Why?

The misconception in the field seems to be that enlistment bonus rates never change. In fact, rates change frequently and are adjusted up or down to meet the specific needs of the Army within each MOS. If an MOS is in critical need of recruits, bonus rates may rise; if an MOS fills up, bonus rates may drop or bonuses may disappear entirely. Rates are analyzed every 3 months, and are adjusted based on progress within each MOS. Regardless of the number of adjustments made, or when they are made, a new recruit is authorized to be paid only the bonus level in effect on the day he enters the DEP. Major fluctuations are possible in enlistment bonus rates between the DEP date and the date a soldier enters active duty, since soldiers can remain in the DEP up to a year.

I'm an SFC. Why can't I be assigned to Fort X? It's short of people in my grade and specialty. My assignment manager said the Fort doesn't have any valid requisitions. Why?

Because there are more authorizations (spaces) in the Army than soldiers (faces), MILPERCEN assigns soldiers under a system of "fair sharing" shortages. Only requisitions which are validated, that is approved for fill, can have soldiers applied against them. While Fort X may have vacancies in an NCO's grade and MOS, other installations may have greater needs or higher priorities.

Do computers make assignments?

No, assignments are not made by a computer. Officer assignments are made by an assignment officer, and only after considering the Army's requirements, the qualifications of available officers, and the officer's preferences.

For enlisted assignments, an automated system called CAP III (Centralized Assignment Procedures III) is used to nominate a soldier for a specific assignment against an incoming, validated requisition. The nomination process is really an automated tool for the assignment manager. Nominations must be verified by the assignment manager and a professional development NCO. Once the assignment has been verified and approved, instructions are transmitted to the servicing MILPO through the automated CAP system.

These automated systems save time and apply DOD and DA assignment criteria uniformly to all soldiers. For example, the automated system screens for soldiers with the right MOS, pay grade, security clearance, or SQI/ASI. Substitution rules, as authorized in DOD and DA directives, are applied uniformly when no soldier matches the requirements of a requisition. An automated process also considers soldier preferences, as recorded on the enlisted master file, and applies standard rules for determining the most eligible CONUS-based soldier for an overseas assignment.

Reprinted courtesy of *FAA General Aviation News*

TERMINAL RADAR GUIDANCE:
A New Concept

Many of the nation's busiest airports are being identified by FAA as candidates for a new airspace configuration designed to replace Terminal Radar Service Areas. The new concept is intended to improve safety and relieve traffic problems arising from the presence of aircraft not in contact with ATC.

Such problems have been obliterated from the "Top 20" busiest U.S. airports, where the Terminal Control Area concept exerts positive control over all traffic. At the next busiest level of airport activity (about 140 such airports have been identified) a *voluntary* system of providing VFR pilots with ATC radar advisory services has been in effect for the past 15 years. Traffic advisories were initially offered, and later sequencing and continuous traffic separation, within a given airspace configuration known as a Terminal Radar Service Area (TRSA).

VFR pilot response to the TRSA concept has been good overall, with many positive benefits. However, the basic problem remained: the presence of some non-participant radar blips signifying targets whose altitude, aircraft type, flight intentions, etc., are unknown to the controllers. These unknowns interrupt the smooth, efficient flow of traffic and sometimes pose potential conflict hazards. Air carriers and other IFR users have argued that all TRSA's should be converted to TCA's

On the other hand, some pilots have criticized the non-standard shape of TRSA airspace with its variety of tiers and cutouts; the varying range of VFR services offered at the TRSA's; the apparent priority given to some non-participating aircraft; and the perceived "over-control" resulting in detours or delays during peak hours.

After considerable discussion with representative segments of aviation, including general aviation pilot associations, airport authorities, and air traffic organizations, FAA has proposd phasing out TRSA's and replacing them with a new concept—the **Airport Radar Service Area** (ARSA), which is far less restrictive than the TCA but calls for mandatory participation. A year-long confirmation of the ARSA prototype at field locations in Texas and Ohio reported very positive results.

Like the familiar Airport Traffic Area the new ARSA is cylindrical in form, beginning at the surface with a five nautical mile radius. At 1,200' AGL, however, the cylinder expands to a radius of 10 miles and continues upward to a height of 4,000' above the primary airport elevation, giving it roughly a mushroom shape. Cutouts or irregularities from this basic design, to accommodate secondary airports, other regulatory airspace, topography, etc., will be allowed on an individual review basis. Controllers will be required to start providing ARSA services, on pilot request, for all aircraft as soon as they enter the airspace surrounding the ARSA—i.e., the airspace approximately 20 nautical miles laterally distant from the tower, extending from the lower limit of radar receptivity to the upper limit of approach control airspace.

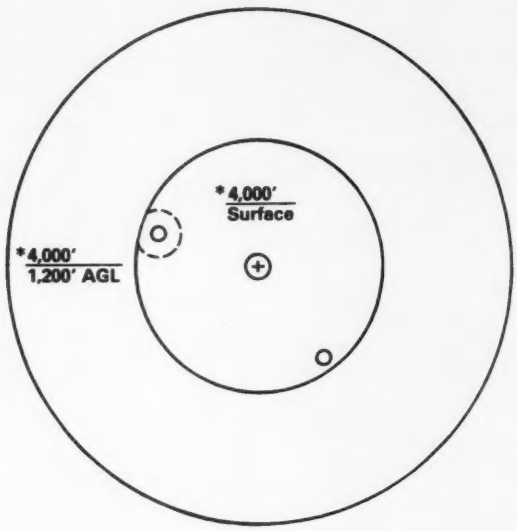
An ARSA will enclose a primary, tower controlled airport and may include one or more satellite airports. Flight operations within the area are subject to the following requirements:

a) **Arrivals and Overflights.** Two-way radio communication must be established prior to entering the area and maintained while within the area. Initial radio contact is with Approach Control, at a recommended distance of 20 miles out from the primary airport.

b) **Departures.** Two-way radio communications must be established by the usual airport routine for the primary airport and then

Airport Radar Service Area

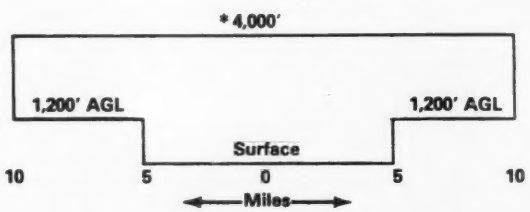
Top View



O = Satellite Airports

* Above airport elevation

Side View



Not to scale

BASIC ARSA SERVICES

ALL AIRCRAFT	VFR AIRCRAFT	IFR AIRCRAFT
• Mandatory Participation • Two-Way radio contact • Sequencing • Safety Advisories • Traffic Advisories	• Desired heading maintained, except for conflict resolution with IFR traffic	• Standard IFR separation • Conflict resolution, if needed

maintained with ATC while within the area. For aircraft departing from an ARSA satellite airport, two-way radio communication must be established with Departure Control as soon as practicable and maintained while within the area.

When flying in an ARSA, VFR pilots should expect to receive *sequencing* for landing; *safety advisories* where appropriate (significant weather information, airport conditions, bird hazards, etc.), *traffic advisories;* and *conflict resolution* when there is an apparent convergence with an IFR aircraft.

Note that there is a considerable difference between traffic advisories and conflict resolution. The former merely call attention to aircraft whose flight path may become a problem; maintaining a safe separation remains the pilots' responsibility. *Conflict resolution* involves vectors issued to either a VFR aircraft *or* an IFR aircraft (or both), at the same altitude, and requires changes of course and altitude.

The first regulatory ARSA's were established in mid-March of this year at Austin, TX; Columbus, OH; and Baltimore, MD. Current sectional charts depict the configuration with a thick, dashed, light blue line with altitude figures. According to Michael Sarli, tower manager at Baltimore/Washington International Airport, the first six weeks of operation have been quite encouraging. Controllers and pilots alike have commented favorably on the advantages of knowing where all the traffic is at all times, and the absence of detours.

Traffic under positive control in the Baltimore ARSA has increased 30 to 35% since the change was made, but controller workload has actually *decreased* because VFR vectoring is seldom needed. For IFR pilots the "stretching" of ATA's into ARSA's (and the dismantling of TRSA's) will have little noticeable effect on their operation, except for lessening their concern about uncontrolled aircraft with unknown intentions. ■

TO BALTIMORE, VIA TRSA AND ARSA

(Excerpts from the log of a low-time pilot who recently sampled the air space in the new ARSA at Baltimore.)

I departed Manassas, VA in a Cessna 172 and proceeded VFR to Baltimore, transitting the Dulles TRSA en route. Within the TRSA I was given the usual separation vectors, which included being moved off my planned course several times for other traffic. Eventually I was vectored back to my original course. Frequently I heard controllers warning, *"Traffic, altitude unknown."*

Twenty miles out from Baltimore, I called Approach Control on the frequency shown on my sectional. I was given traffic advisories (altitude and heading) but allowed to continue on course until I was sequenced for landing.

On departure, again VFR, I was simply told "fly runway heading," (runway 28) which also happened to be my desired outbound course. Controllers turned me left momentarily to allow passage of a *Citation* which had taken off behind me. Once back on course, I stayed there, receiving traffic advisories—again, no unknowns.

The trip back through the Dulles TRSA was much the same as before, except that during its busy afternoon hours, in the process of receiving the required traffic separation, I was vectored more than the morning trip. This resulted in a southeasterly detour, as I made way for "heavies" landing at Dulles.

LIST OF ARSA CANDIDATE LOCATIONS

Anchorage, AK

Birmingham, AL
Huntsville, AL
Mobile, AL
Montgomery, AL

Little Rock, AR

Phoenix, AZ
Tucson, AZ

Burbank, CA
Monterey, CA
Oakland, CA
Ontario, CA
Palm Springs, CA
Sacramento, CA
San Diego, CA
Santa Ana, CA

Colorado Springs, CO

Windsor Locks, CT

Daytona Beach, FL
Ft. Lauderdale, FL
Jacksonville, FL
Orlando, FL
Pensacola, FL
Tallahassee, FL
Tampa, FL
W. Palm Beach, FL

Columbus, GA
Macon, GA
Savannah, GA

Kahului, HI

Cedar Rapids, IA
Des Moines, IA

Boise, ID

Champaign, IL
Moline, IL
Peoria, IL
Rockford, IL
Springfield, IL

Evansville, IN
Fort Wayne, IN
Indianapolis, IN
South Bend, IN

Wichita, KS

Cincinnati, KY
Lexington, KY
Louisville, KY

Baton Rouge, LA
Lafayette, LA
Lake Charles, LA
Shreveport, LA

Baltimore, MD

Portland, ME

Flint, MI
Grand Rapids, MI
Kalamazoo, MI
Lansing, MI
Saginaw, MI

Gulfport, MS
Jackson, MS

Billings, MT

Charlotte, NC
Fayetteville, NC
Greensboro, NC
Raleigh, NC

Lincoln, NE
Omaha, NE

Atlantic City, NJ

Albuquerque, NM

Reno, NV

Albany, NY
Buffalo, NY
Islip, NY
Rochester, NY
Rome, NY
Syracuse, NY
White Plains, NY

Akron-Canton, OH
Columbus, OH
Dayton, OH
Toledo, OH
Youngstown, OH

Oklahoma City, OK
Tulsa, OK

Portland, OR

Allentown, PA
Erie, PA
Harrisburg, PA

San Juan, PR

Quonset Pt., RI

Charleston, SC
Columbia, SC
Greer, SC

Bristol, TN
Chattanooga, TN
Knoxville, TN
Memphis, TN
Nashville, TN

Abilene, TX
Amarillo, TX
Austin, TX
Beaumont, TX
Corpus Christi, TX
Lubbock, TX
Midland, TX

Salt Lake City, UT

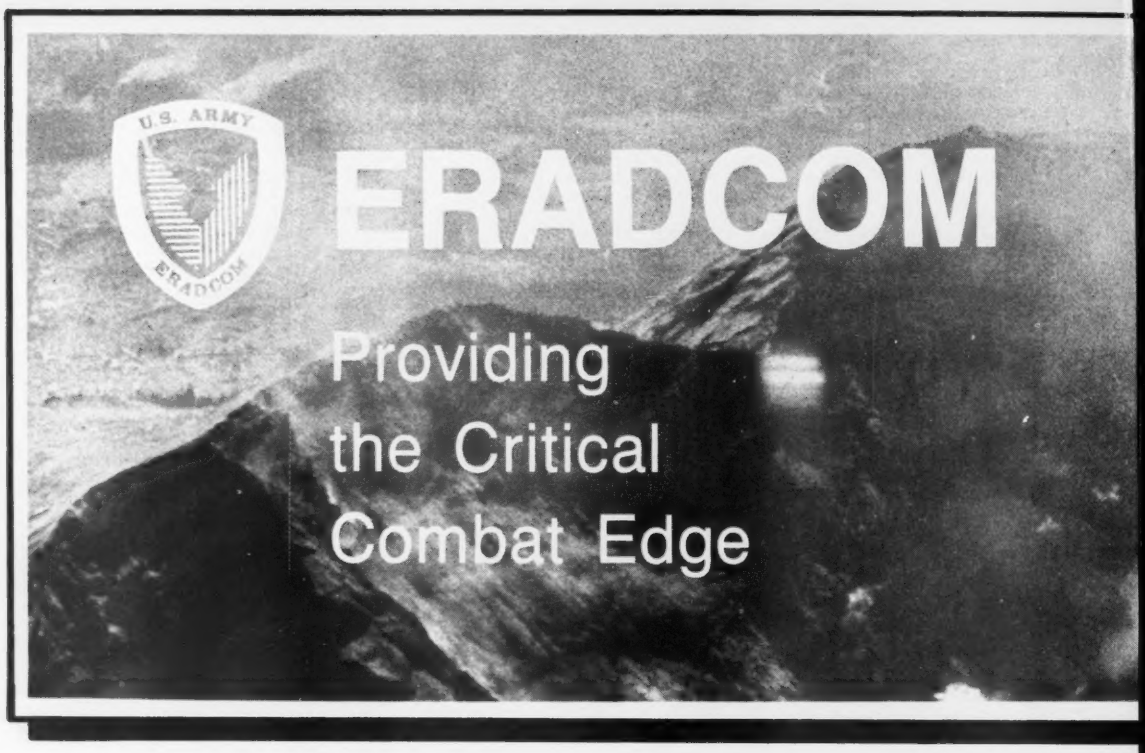
Chantilly, VA
Norfolk, VA
Richmond, VA
Roanoke, VA

Burlington, VT

Spokane, WA
Tacoma, WA

Green Bay, WI
Madison, WI
Milwaukee, WI

Charleston, WV



The Rest of the Family

The depth and scope of the Electronic Research and Development Command's (ERADCOM's) contribution to Army Aviation have been vividly portrayed in recent issues of the *Aviation Digest.* The missions and areas of responsibility of selected ERADCOM organizations have been examined, and all areas of the Defense Acquisition Process have been covered, from basic research to system management, throughout the life cycle of selected equipment. This article completes the ERADCOM picture by introducing you to the rest of the ERADCOM family.

Combat Surveillance and Target Acquisition Laboratory (CSTAL)

CSTAL researches and develops capabilities in tactical battlefield detection, location and recognition, including technology areas such as radar, identification friend or foe (IFF), nuclear radiation detection and measurement, acoustic weapons location, remote sensing, meteorological data systems, sensor integration, imagery interpretation, and data fusion for intelligence and target acquisition. This work is accomplished by five major divisions within CSTAL.

The ***Radar Systems*** and the ***Intelligence Surveillance Target Acquisition Systems Divisions*** provide Army Aviation with the capability to detect and pinpoint the threat. Perhaps the most well-known of their products is the AN/APS-94 side looking airborne radar mounted on the OV-1

Captain (P) Greg Kaufmann
ERADCOM Flight Test Activity
Naval Air Engineering Center, NJ

Mohawk. This radar, first fielded in 1960, has undergone continuous product improvement programs; all a part of the continuing effort to improve the Army's only jam-resistant airborne radar for the surveillance of moving ground targets.

The ***IFF Systems Division*** is responsible for development through the initial production of IFF devices and equipment. The long-term objective of the IFF program is to positively detect, classify and identify fixed and rotary wing aircraft with radar signature analysis. An intensive effort is underway to develop signature analysis algorithms and to collect a library of equipment signatures.

The ***Radiac Division*** conducts research, development, test and evaluation (RDTE) and initial production of detection and measurement techniques, devices, equipment and systems in the areas of nuclear radiation and nuclear bursts. A family of nuclear radiation detection instruments for ground and airborne use, featuring low power demand, miniature size, stable performance and ruggedness for the military environment, is under development.

The final division, ***Special Sensors,*** works with technologies that advance the Army's surveillance and target acquisition capabilities. Two prominent areas in which this division is working are advanced research in the use of acoustical ranging techniques, and providing the Army with imagery exploitation techniques and equipment from surveillance systems. This latter area includes the Mobile Army Ground Imagery Interpretation Center, which will provide the rapid interpretation, production and dissemination of intelligence and target acquisition information derived from aerial surveillance and reconnaissance sensors. Special Sensors Division is also intimately involved with the production of new meteorological equipment to support not only the Field Artillery but also Army Aviation in the area of weather surveillance instrumentation, to include weather radar.

CSTAL's mission can be summed up in one simple phrase—provide the capability to effectively sense, understand, evaluate and predict any real or potential threat. As a result of this mission, CSTAL often finds itself working alongside the Intelligence and Security Command to develop new, and refine existing, equipment and systems. The latest area of interest is the development of VISTA—very intelligent surveillance and target acquisition—sensors. Having both ground and air applications, VISTA will provide battlefield commanders with concise, preprocessed surveil-

lance data from all sensors. CSTAL, with its work in the surveillance and target acquisition fields, truly contributes a major portion of the complete picture of the battle provided to combat leaders.

Harry Diamond Laboratories (HDL)

HDL is a full-spectrum laboratory in technologies ranging from basic research to industrial engineering. The principal areas of interest pursued at HDL are electronic fuzing, nuclear weapons effects, fluidics, radar/signal processing and antiradiation missile countermeasures. One of the most important technological breakthroughs of World War II, the proximity fuze, was developed at HDL. Additionally, photolithography, the technique used today in the manufacture of all transistors and integrated circuits, was invented by HDL scientists. HDL also pioneered the technology of fluidics—the concept of fluid control with no moving parts.

As a result of early research on how magnetic mine fuzes could be affected by a nuclear detonation, HDL has become the Army's lead laboratory in nuclear weapons effects. Today, HDL's research in radiation effects takes the form of testing and nuclear hardening of tactical and strategic weapon and communications systems. As a result of this research, HDL operates AURORA—the world's largest full threat gamma radiation simulator—under the sponsorship of the Defense Nuclear Agency. Nuclear weapons effects, including transient radiation effects, internal electromagnetic pulse and radiation-induced mechanical shock/fracture can be simulated to test the nuclear vulnerability of entire weapon systems.

HDL also provides the technology base for battlefield surveillance radars, including the development of multistatic, netted and millimeter-wave radars. For aviator training, HDL built the first radar simulator that could emulate foreign weapon control radars.

Aerial film is inspected on a manual light table in the MAGIIC van.

Electronics Technology and Devices Laboratory (ETDL)

ETDL basically operates as a technology and devices/components support base. It provides the Army's primary thrust for advancing the technology base in electronics and electron devices on a broad front, such as integrated circuits, semiconductors, microwave tubes, power sources, signal processing and displays.

In line with their role as the Army's experts in electronic devices, ETDL establishes a relevant, timely RDTE plan which will solve the critical device and subsystem barrier problems limiting the performance, reliability and affordability of battlefield systems. This RDTE plan is developed after a thorough analysis of the enemy threat, Army doctrine and specific Army electronic systems plans and priorities.

There are many areas in which ETDL is working to improve the Army's capabilities. Two examples are displays and microwave and millimeter-wave devices. Data generated from battlefield sensors is of value only if the soldier can "see" that data quickly and accurately. Current commercial display technology is not suitable for battlefield use. ETDL is developing electroluminescent display panels that are portable, interactive and legible in sunlight.

Low cost microwave and millimeter-wave devices make possible a number of vital military functions: penetration of an obscured battlefield; reliable high power transmitter modules for radar; real-time, jam-resistant acoustic signal processors and stable crystal oscillators for communications, command and control and for navigation. One application of millimeter-wave components makes possible small, solid state

transmitters. These transmitters are used in vehicular, all-weather target acquisition radar systems and missile seekers where size and weight are critical.

Technical Support Activity (TSA)

This organization at Ft. Monmouth, NJ, maintains capabilities in numerous areas to support the Army's electronics community. The Technical Library Division has computer access to online open literature and Russian translation journals. More than a million items are indexed and catalogued. The Tactical Software Support Center can develop software modifications that remove troublesome defects and provide added capabilities. This was accomplished for the GUARDRAIL system. Other services are performed in the areas of mechanical and electromechanical engineering, installation design, specification engineering, environmental testing, logistics management, drafting and fabrication and shop support. A repository of almost one million drawings and specifications on electronic equipment now in use by the Army is maintained to assist TSA in execution of its varied missions.

There are two other elements within ERADCOM that deserve recognition.

Countermeasures/ Counter-Countermeasures (CM/CCM) Center

The CM/CCM Center acts as the U.S. Army Materiel Command's focal point to assure technical and tactical CM/CCM are properly considered throughout the materiel acquisition and life cycle process. This is accomplished by:

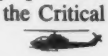
- Assessing technology which is applicable to increasing the survivability of U.S. materiel.
- Monitoring current threat estimates for Army materiel.
- Formulating, coordinating, promoting and managing for the Army a comprehensive program of RDTE.

The RDTE provides information, materials, techniques and facilities necessary for the evaluation of survivability/vulnerability and for the hardening of Army electro-optical, radar and communications systems or subsystems.

Office of the Deputy Project Manager for the Joint Surveillance Target Attack Radar Systems

This office basically is responsible for maintaining a balanced program to accomplish the stated objectives of the Army portion of the Joint Services program. While the long-range goals of this program are in a state of flux due to recent agreements between the Air Force and the Army, there are other items for which this office is responsible. They are derivatives of this program; e.g., short range air defense communications, command and control and intelligence radar and, most notably, the Standoff Target Acquisition System currently fielded in Europe.

Over the past 6 months, ERADCOM's contributions to Army Aviation have been examined as delineated by the missions and responsibilities of its subordinate elements. It should be evident that ERADCOM is involved in every facet of modern Aviation operations. This involvement will continue to grow as Army Aviation develops and refines its future requirements, especially as related to the light helicopter family. The increasing movement toward electronic sophistication guarantees this involvement. However, as the ERADCOM commander, Brigadier General (P) James C. Cercy, mentioned in his series introduction (April 1985 *Aviation Digest)*, the acquisition process works best when you, the user, define a need and let the chain know about it. Without your involvement, the acquisition process will weaken. You are encouraged to contact this organization at any time. The Aviation Office, AUTOVON 624-2116/2117, is prepared to assist you in any way possible. ERADCOM—Providing the Critical Combat Edge.



Editor's Note: On 1 October 1985, ERADCOM will cease to exist. In a major realignment, a new command—Laboratory Command—was created around the ERADCOM nucleus. Watch for the concluding article to this series which will discuss this reorganization.

Previously published articles dealing with the Electronics Research and Development Command are: (1) "Atmospheric Science Laboratory: Weather Intelligence Enhances Capabilities" (April 1985); (2) "EFTA Validation Concept Throughout Development" (May 1985); (3) "NVEOL and FTD" (July 1985); (4) "Electronic Warfare Laboratory and Signals Warfare Laboratory" (August 1985). Copies of these articles may be obtained by writing to *Aviation Digest,* P.O. Box 699, Ft. Rucker, AL 36362-5000, or by calling AUTOVON 558-6680 or FTS 533-6680.

Lieutenant Colonel William R. Kruse
and
Captain Donald M. Maciejewski
U.S. Army School of Aviation Medicine
U.S. Army Aeromedical Center
Fort Rucker, AL

IT IS CERTAINLY no secret that since April 1983, the U.S. Army Aviation Branch has grown by leaps and bounds.

Along with this spirited growth, the Aviation Branch has, in the interest of unification, strived to unite all Aviation personnel and assets under a single domain. At this time,there is only one small but important group of assets that has not been incorporated into the branch—namely, Army Medical Department (AMEDD) Aviation.

At first glance, this situation may appear to be an oversight; however, there are many important reasons why the AMEDD should remain a separate and distinct entity, not the least of which is the essential lifesaving service provided to the combat soldier. Many will argue that the medical evacuation (MEDEVAC) mission can be accomplished by any utility helicopter and crew. Although this may be true in some isolated instances, the AMEDD's mission is to provide the best possible support to all soldiers all of the time. The AMEDD aviators are not only aviators but also highly trained medical professionals. They have a complete understanding of the total medical system that is present on the battlefield and in the theater of operations.

This refined knowledge of evacuation priorities, techniques and existing medical support capabilities not only allows for more expeditious evacuation and treatment of combat casualties, but also ensures the viability and enhancement of the world's proven best aeromedical evacuation system. This aeromedical evacuation system requires the best implementors and planners for it to grow with the many improvements in medical treatment capabilities as well as the many improvements in the way we win the battle.

Put yourself in the boots of a wounded soldier for just a minute. Suppose that you are seriously wounded and require emergency surgery. Time is of the essence. In this situation, you would hope that the medical system in place will be responsive to your needs. Dedicated aeromedical aircraft and crews trained within that medical system represent the optimum response: The American combat soldier deserves no less than the optimum response.

History repeatedly shows us that the AMEDD has successfully provided this ultimate care in Korea, Vietnam, and most recently in Grenada and Honduras. What was once a dreaded and laborious procedure has become a professional, expeditious and highly successful **D**edicated **U**nhesitating **S**ervice **T**o **O**ur **F**ighting **F**orces. Many combat casualties receive complete medical care within 15 minutes of being wounded! A major part of the success of aeromedical evacuation is the AMEDD crew that consists of a highly trained professional aviator, flight medic and crewchief.

What about the training of the AMEDD aviator? How does this individual fit into the overall scheme of supporting the combined arms team? Along with the advances being made by the Aviation Branch, the Army Medical Department has taken definitive measures to ensure that AMEDD Aviation is keeping abreast of the major developments taking place.

Professional Aviation education, in terms of tactics, Aviation doctrine and battlefield survivability, is of paramount importance to the Army aviator. On 4 June 1984, the Aviation Officer Advanced Course began its historical first

formal class for Aviation Branch captains. Within this class, the Medical Service Corps also had representation, and with this first class the course of military education for the AMEDD aviator took on a new and exciting look.

Through the coordinated efforts of the Aviation Branch and the AMEDD, it was agreed that beginning 1 January 1985, all AMEDD aviators would attend the Aviation Officer Advanced Course. This dramatic educational change not only better qualifies AMEDD aviators in the vast realm of Army Aviation but lays the foundation for the necessary team environment.

Realizing further the need to continue the development of AMEDD aviators in medical systems, the Academy of Health Sciences (AHS) formulated an intense 5-week, medical-systems-oriented course for AMEDD aviators to attend, following the Aviation Officer Advanced Course. This pattern of educational development allows AMEDD aviators to grow along with their Aviation Branch counterparts, yet they still maintain the much needed medical specialization required to effectively operate as a part of the Aviation team but *from within the medical system* on the modern day battlefield. Dedicated medical support requires highly trained aviators who are extensively versed in Aviation, medical theory and practices. This is being achieved through the professional development of AMEDD officers in both critical specialties—medicine and Aviation.

Additionally, all AMEDD aviators upon graduation from flight school attend medical specific training, the Essential Medical Training for AMEDD Aviators Course, currently taught at Ft. Sam Houston, TX. Recently, however, a proposal has been submitted to expand this course incorporating more medically specific training and also more Aviation mission oriented training. Furthermore, this recent proposal recommends that the course be moved to Ft. Rucker and be taught by the U.S. Army School of Aviation Medicine (USASAM). These recommendations are expected to be favorably considered and implemented in the fiscal year 1986 timeframe.

Another interesting development that began in July 1983 is the Flight Medical Aidman Course (91B2F), taught entirely at the USASAM. This course was designed to educate enlisted medical aircrewmembers to perform as flight medics in a combat environment. For more information about this course, see "Flight Medic Course," scheduled for a future issue.

As of 1 October 1984, the organization that for years has taught aeromedical subjects to all Army aviators became a school itself; the U.S. Army School of Aviation Medicine. With the establishment of this professional school, responsibility for working AMEDD Aviation proponency actions also was assigned temporarily to the school staff. This year, however, a separate proponency action office will be established and manned at Ft. Rucker and colocated with USASAM. This office will be called the U.S. Army Medical Evacuation (Air/Ground) Proponency Action Office and will be a part of the overall AMEDD Proponency Action Office located at Ft. Sam Houston, and will work for the commandant of the Academy of Health Sciences.

The mission of this proponency action office will be to advise the commandant of the U.S. Army Academy of Health Sciences and the Surgeon General on all medical evacuation proponency matters. Additionally, this office acts as a liaison and referral between personnel and organizations for AMEDD Aviation in the field (active and reserve; table of organization and equipment; and tables of distribution and allowances), the AHS, USASAM/USAAMC and the U.S. Army Aviation Center. In addition, the proponency action has responsibilities which include:

- Assisting in the development of regulations which clarify who is responsible to develop what products, and how work is accomplished.
- Administering the medical evacuation (air/ground) proponency program by assisting in managing branch specialties and career management fields in all phases of the personnel life cycle management model.
- Monitoring matters pertaining to doctrine, equipment, organizations, training and personnel involved in medical evacuations.
- Coordinating with integrating centers, AHS and U.S. Army Training and Doctrine Command, Military Personnel Center and Army Medical Department Personnel Management Agency, Soldier Support Center and Office of the Surgeon General and Headquarters, Department of the Army, on matters affecting medical evacuation.

The U.S. Army Medical Evacuation (Air/Ground) Proponency Action Office staff will be headed up by a Medical Service Corps colonel and will have proponent coordinators to assist. These individuals will respond to inquiries and initiate actions regarding medical evacuation (air/ground). The efforts set forth here are channeled to maximize the effects of the MEDEVAC mission and to prepare this valuable combat service support asset to perform well in combat.

The ultimate goal of the Medical Evacuation Proponency Action Office is to provide a focus and to move forward with the Aviation community, and to enhance AMEDD Aviation. The objective of paramount importance is to *better* prepare medical evacuation personnel for war as a highly trained member of the combined arms team. Medical evacuation is an integral part of the health care delivery system in both peacetime and combat.

Dedicated medical evacuation support is vitally necessary if we are to ensure trained soldiers are returned to duty. The mission of the Army Medical Department is achieved when we "Conserve the Fighting Strength." The institution of this proponency office will assist in making that medical support a reality! "Separate—but not apart," is not the paradox that it seems. AMEDD Aviation is a distinct, viable entity which is a proud team player supporting the most mobile, flexible and elite branch of the military—U.S. Army Aviation!

This is the last in a series of five articles introducing the AH-64 Apache combat mission simulator (CMS). Part I (March 1985) discussed battleground characteristics and the creative area block design approach taken to overcome previous limitations in geographical data base designs. Part II (April 1985) covered portions of the Apache simulation math model with emphasis on weapons. Part III (May 1985) summarized the simulation of the threat force, a feature that sets the CMS apart from earlier simulators. In Part IV (August 1985) the complexities of controlling the training process and tools available to the instructor were illustrated. This article, Part V, discusses future plans and enhancements for the CMS, which will ensure the maximum possible return on investment for this sophisticated training system.

AH-64 APACHE
Combat Mission Simulator

Kill or be Killed

Part V: The Future

IN PART I, the data base modeling concept was presented. Allocation of computer capacity was discussed in terms of edges. The 1982 state-of-the-art computer image generation hardware processed insufficient scene density in real time. The visual world created, for the most part, was constructed using straight line segments to form polygons, which in turn form objects or terrain features. To construct a scene or data base representative of the real world with straight line segments is beyond the available computer processing power. To overcome this problem a technique for texturing surfaces is currently being developed.

Hardware Texture.

The need for texture arises because computer generated scenes exhibit a lack of visual cues, especially in the near field of view. This makes the task of judging distance to objects difficult and in some cases impossible. The visual data base for the prototype CMS contains an overlay grid pattern (checker board) on all terrain over which the trainees are expected to fly (nap-of-the-earth maneuver areas), figure 1, page 42. The grid pattern, consisting of 50-foot squares, is modeled directly on terrain surfaces. A portion of this grid pattern is always in the visual field of view, and provides an artificial cue even when proximity to terrain results in only one or two faces being viewable. Besides appearing unnatural, the shortcoming of this grid pattern in the data base is that it consumes edges, or in other words, computer processing capacity. Hardware texture will replace the grid pattern and free up what were wasted edges, using this capacity to make more realistic trees and other objects in the data base.

Mr. Richard Oswald
and
CW4 William Yarlett
Office of the Project Manager
for Training Devices
Naval Training Center
Orlando, FL

FIGURE 1: Software texture scene.

FIGURE 2: Hardware texture scene.

Hardware texture, as the term implies, is accomplished in physical hardware and is not software or processing dependent. All production units of the CMS will be equipped with hardware texture. Accelerated delivery of the first production unit will require the texturing equipment to be added after delivery, but subsequent units will have the feature included at the time of CMS delivery. Currently the prototype unit contract does not include hardware texture, but expectations are that it also will be added after delivery. When that occurs, the software texture or grid patterns will be deleted.

Hardware texture, as it appears to the observer, consists of a series of patterns which are placed on surfaces in the scene. The system will have the capability of generating 16 different patterns and by modulating them, in essence, create an infinite number of texture arrays (figure 2). Specific patterns will be generated to create the effects of rough water surfaces, plowed fields, grain fields, tree canopy, grass, uncovered terrain and variations thereof. Hardware texture will provide each surface with a perspectively correct natural appearance. The cues provided by hardware texture will allow crews to make better judgments about attitude, distance, closure rate, acceleration and the slope of surfaces than they can without texture. Hardware texture also will create enriched scenes that will greatly enhance nap-of-the-earth capabilities of the CMS.

Data Base Modeling Capability.

An off-line hardware and software capability is being purchased by the Army with the prototype CMS. This will enable the user to generate visual data base modifications. The equipment, known as VISGEN (visual generator), will be located at the institutional training site, Ft. Rucker, AL. Personnel from the Worldwide Software Support Center at Ft. Rucker, who have been involved with the data base development process from the beginning, will receive additional training on the VISGEN system before its delivery. The objective is to develop an inhouse Army capability for modifying the data base without extensive lead time.

The VISGEN system (figure 3) consists of a digitizing tablet, keyboard, cathode ray tube (CRT) display, stand alone computer and application software. With this equipment, data base enhancements, such as adding or deleting objects and altering terrain

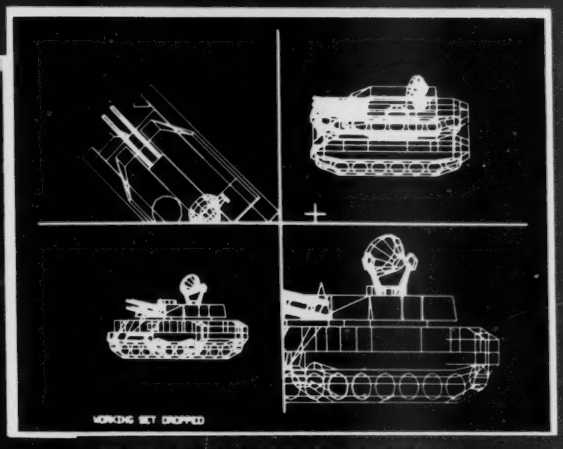


FIGURE 3 (left): VISGEN Digitizing table.
FIGURE 4 (above): VISGEN display of ZSU-23-4 threat antiaircraft system.

slope, can be made. The system permits entry of data directly from maps and drawings with scaling accomplished by automatic software means. Data base objects and features are displayed on the CRT as data is entered or changed by the operator (figure 4). Either orthagonal (three views) or perspective views, with or without hidden lines, can be displayed as selected by the operator. A cursor will be used to make geometric changes to features directly via the CRT display.

As discussed in Part I (of this series of articles) the battleground depicted in the CMS is typical of portions of central Europe with ridge lines, valleys and small villages. What about operation in other regions? Can we model deserts, jungles or other areas? The capability of VISGEN, under Army control, remains to be demonstrated. The system is not intended to provide a major modification capability. The ability to efficiently generate new data bases for jungle or desert operations, to the same level of complexity as the existing data base, is probably beyond the present VISGEN capability. Hopefully, sufficient inhouse resources will one day be made available to develop the capability to generate limited terrain sections depicting other parts of the world. Such a capability may be possible using the 1 km by 1 km area block concept and might be attached to the CMS airfield area in support of specific missions.

Since all the new synthetic flight training system simulators include the Army Tactical Digital Image Generation (ATACDIG) and variations of the CMS data base, the VISGEN system will be used to support data base work on these simulators as well. As of this writing, data base design for the UH-60 Black Hawk, AH-1 Cobra and CH-47 Chinook simulators are being defined. Based upon experience with the CMS, however, the Army will be well equipped to handle the initial user need.

Preplanned Product Improvement (P^3I).

From the inception of the CMS program, a preplanned product improvement effort was identified and planned for. The P^3I requirement grew out of the need to accelerate procurement of the CMS and consideration of the rapidly changing state-of-the-art in visual technology.

The need to perform all of the identified combat skills training in the CMS required delivery of the prototype device as close to delivery of Apache helicopters as possible. CMS delivery schedule was identified as the primary program driver. To meet the schedule requirements, the CMS

design was frozen prior to the completion and stabilization of the aircraft configuration. That meant in some areas the CMS configuration delivered might not reflect the aircraft configuration. Fortunately, the differences were minimal and not in critical areas. For the most part the CMS reflects aircraft configuration and performance as frozen in June 1983. A major exception is software resident in the fire control computer (FCC). Since this area is critical to training, the FCC software load approved for the helicopter in April 1985 has been incorporated into the CMS.

P³I for aircraft configuration and performance will be accomplished as block updates starting in calendar year 1988. Modifications will be prepared as installation kits to minimize simulator downtime. The production CMS contract contains provisions for continuous tracking and evaluation of aircraft changes. The effort is being performed by a configuration update group with representation from:

- Army program management
- The user command
- The CMS contractor
- The aircraft manufacturer and its major subcontractors.

The reviews of these changes and recommendations are made on a quarterly basis. The process allows critical changes to receive proper visibility for emergency incorporation into the CMS when necessary, and establishes thorough documentation for other changes designated for inclusion in P³I block updates.

The second requirement for the P³I program evolved as a result of the rapid change in state-of-the-art in visual simulation technology in early 1982. Then, both Army and industry personnel recognized that state-of-the-art visual systems could not meet all CMS requirements. The CMS delivery schedule did not allow for any significant visual development work, and the CMS specification was written around existing systems.

The CMS visual was designated as an interim system consisting of modified existing designs with limited areas of new design. As a parallel task, a separate research and development program was started to advance technology in visual systems with specific application to the CMS. This project was given the name Visual System Component Development Program (VSCDP). The initial concept was to have the task completed prior to the CMS production award. However, acceleration of the production contract and delay in the VSCDP prevented the production CMS from incorporating any new developments.

Currently, the prototype and production units of the CMS are identical, including the visual systems, and the VSCDP tests and demonstrations are to be completed late this year. Potential change to the CMS, based upon VSCDP results, will be evaluated when tests are complete and enhancements will be incorporated if deemed practical and necessary.

Fortunately, development of the ATACDIG has progressed beyond initial expectations, especially with the addition of hardware texture. ATACDIG performance may adequately satisfy all training tasks which would make a visual system upgrade unnecessary.

The CMS P³I program also will look at potential incorporation of an air-to-air training capability. As new threat antiaircraft systems and surface-to-air missiles evolve, quasi-intelligent models of them will replace out of date threat systems in the CMS so crews can train against the most current and lethal systems the threat can throw our way.

And last, the project manager for training devices is closely monitoring ongoing research efforts of the Defense Mapping Agency to improve satellite photography resolution, which in turn may allow the generation of a simulator data base from *actual* photographs of terrain anywhere in the world.

Deriving Maximum Benefit From The CMS.

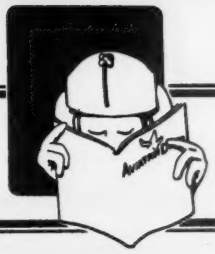
Acquisition of the combat mission simulator represents a sizable investment in complex simulation equipment by the U. S. Army. It is one of several ongoing or planned programs with extremely high unit cost, used for individual or small crew training. Analysis of the costs of these programs, and prediction of resultant benefits as compared to alternative methods of training, is a complex process involving many variables.

Maximum benefit can only be derived from the CMS, or any training system, when it is operated at its maximum capacity. Additionally, maximum use must offset the maximum number of operational system operating hours. For that to happen, not only must the CMS be designed and delivered as an *effective* training tool, it must continue to be kept current with aircraft changes through product improvements. To protect the Army's investment, the mechanism for accomplishing this goal is in place and already working.

The combat mission simulator is one giant breakthrough in the simulation industry. It provides the Army with the first cost-effective, real-time training capability to achieve and maintain combat skills proficiency.

As good as it is, we are working to make it even better. The CMS and follow-on simulators like it, with current CMS training capabilities and upcoming enhancements, are the future of Army Aviation. Economically, technically and educationally, the CMS exceeds what we can safely train to do in the actual aircraft. Train to Kill...or be Killed.

VIEWS FROM READERS



Editor:

The article "What Does USASAM Stand For?" by CPT Wilson (April 1985), caught my eye as I was reading your magazine. His statements that, "The Navy presently trains only our flight surgeon and flight medic students in Pensacola, FL," and, "We have been tasked by the Aviation consultant to the Surgeon General to explore the feasibility of including underwater egress training in the initial entry aviator course," bring to mind some suggestions and comments:

• Instead of the helodunker, as used by the Navy, the school should consider using modified, approved Army training devices, i.e., DVC #01-81A, OH-58C series Composite Systems Trainer, or DVC #01-31, AH-1G Composite Systems Trainer. These training aids, modified for water survival training, would provide students with a realistic aircraft simulation of what they are more than likely to find themselves in during an actual water survival situation.

• Refresher training should be scheduled for all aviators and enlisted crewmembers at 4- or 5-year intervals or at least when the aviators or crewmembers return to Ft. Rucker for advanced training, i.e., Warrant Officer Advanced Course, Aviation Officer Advanced Course, BNCOS or ANCOS.

• Thought should be given to this type training for units that rely heavily on Army aircraft for movement of troops, i.e., Rangers, Special Forces, 101st Airborne Division (Air Assault) and the 82d Airborne Division.

This unit recently (2 May 1985) underwent water survival training at the Water Survival School, Naval Air Station, Jacksonville, FL, using the helodunker and hoist with simulated rotor wash. Personnel who participated in this training commented that it should be mandatory for all flight crews involved with overwater flights. The training was outstanding and the Navy professionals who provided it for this unit were the best in the business.

SGT Bryan C. Staples
Training NCO
659th Medical Detachment
South Carolina Army National Guard

Articles from the Aviation Digest requested in these letters have been mailed. Readers can obtain copies of material printed in any issue by writing to: Editor, U.S. Army Aviation Digest, P.O. Box 699, Ft. Rucker, AL 36362-5000.

Corrective Lenses, NVG and You

Important notice to all aviators who wear corrective lenses and use night vision goggles (NVG):

The U.S. Army Aeromedical Research Laboratory has conducted studies of the impact-resistance of various materials used for prescription lenses. The standard issue lenses for aviators are made from specially treated glass. The studies show that these glass lenses are not nearly as impact-resistant as those made of a material called polycarbonate. About 3 months ago Aviation personnel were notified by TWX, and also a statement in ***Flightfax***, that if they wore corrective lenses and flew with modified NVG, they should contact their local eye clinic or flight surgeon to order the new polycarbonate lenses. This is a research project and is restricted at this time to Active Army personnel who wear single-vision (no bifocal) lenses. They are only available in clear color, and each eligible individual will receive one pair.

If you qualify for this program, you are ***strongly urged*** to have your current glass lenses replaced. If you are in a command position, you should ensure that your flight personnel are made aware of this program and are encouraged to participate.

Information about this program has been made available to all U.S. Army eye clinics and flight surgeons. However, should you have any questions you may contact Dr. John Crosley at the U.S. Army Aeromedical Research Laboratory, P.O. Box 577, Ft. Rucker, AL 36362-5000 or call AUTOVON 558-6824.

U.S. Army Information Systems Command
ATC ACTION LINE

PARACHUTE JUMPING

CONTRARY TO WHAT some may believe, there are regulations and procedures pertaining to nonemergency parachute jumping. All participants should be aware of the appropriate rules and procedures (FAR 105, FAAH 7110.65, AR 95-19) pertinent to jumping operations.

Air traffic controllers should refer to paragraph 8-80 through 8-83 of FAAH 7110.65. Only the following situations require controller authorization for jumps:

- in or into a control zone with an operating U.S. control tower; or
- in or into the positive control area; or
- in or into an airport radar service area (ARSA).

The following paragraphs summarize the authorization, approval and notification requirements for parachute jumps in the National Airspace System.

Over Or Into Congested Areas Or Open Air Assembly Of Persons:

- Requires certificate of authorization (waiver) from the FAA Flight Standards District Office having jurisdiction in that area.
- Application for the certificate must be made to Flight Standards District Office at least 4 days before jump.

Over An Airport Without A Functioning U.S. Operated Control Tower Or Onto Any Airport:

- Requires authorization from the airport management.
- Request for approval must be submitted to the control tower having jurisdiction over the control zone before jump.
- Controllers may either authorize or withhold authorization for jump.

In Or Into Positive Control Area:

- Requires authorization from the FAA air traffic control facility having jurisdiction over the airspace involved.
- Request for authorization must be made to the nearest FAA flight service station, air route traffic control center or terminal control facility before jump.
- Controllers may either authorize or withhold authorization for jump.

In Or Into An ARSA:

- Requires authorization from the control tower.
- Request for authorization must be submitted to the control tower having jurisdiction over the ARSA before jump.
- Controllers may either authorize or withhold authorization for jump.

In Or Into Other Airspace (Controlled Or Uncontrolled):

- No authorization required.
- Requires notification to nearest FAA flight service station, air route traffic control center or terminal control facility.
- Notification must be made at least 1 hour, but not more than 24 hours, before jump is to be completed.
- Since no authorization is required, controllers may not disapprove jump.

Jumps Over Or Within Restricted Or Prohibited Areas:

- See FAR 105.27 for details.

Radio Communication Requirements For Jumps In Or Into Any Controlled Airspace:

- Radio communication is required with the nearest FAA flight service station, air route traffic control center or terminal control facility for the purpose of receiving traffic information. *Remember traffic information must be received by the pilot before jumping may begin.*
- Pilot must monitor the air traffic frequency from initial contact until last jumper reaches the ground.
- Pilot must advise the air traffic facility when the last jumper reaches the ground.

There Are No Radio Communication Requirements For Jumps Entirely Within Uncontrolled Airspace. It's a fact that most of us don't handle jump operations on a frequent basis. Take advantage of this opportunity to review the applicable rules and procedures.

Specific questions concerning parachute jumping should be directed to Mr. John McKeeman at AUTOVON 284-7796/6304 or Commercial (202) 274-7796/6304.